Randomised Controlled Trial and Process Evaluation of Code Clubs

On behalf of Code Club UK

National Foundation for Educational Research (NFER)

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Randomised Controlled Trial and Process Evaluation of Code Clubs

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Foreword

As a charity with an educational mission, we take our responsibility to engage with the evidence of what works very seriously. We strive to understand and to apply the lessons learned from research done by others, both past and present, whether that is in the fields of computer science education or curriculum design, or related to wider issues of pedagogy and learning through making.

We also want to be rigorous in evaluating our own programmes. That's important because it helps us constantly to improve what we do. However well we are doing, we can always be better. We also hope that, by publishing the results of our evaluations openly, we can help to advance the field of computing and digital making even further.

Over the past year, we have worked with the National Foundation for Educational Research (NFER) to evaluate Code Club, our network of volunteer- and teacher-led after-school programming clubs, through a randomised controlled trial.

This is, to our knowledge, the only randomised controlled trial of an after-school computing programme that has ever been commissioned, and it therefore represents a big step forward for the field. We are very grateful to NFER for conducting the research, and to Nesta and the Cabinet Office, who provided funding to allow this to happen. We are also very grateful to all of the teachers and young people who participated in the trial.

The trial clearly showed us that Code Club has a significant and positive impact on children's programming ability. Teachers said that Code Club improved children's skills and confidence in programming, ICT, and areas such as problem solving. We are pleased that many teachers also reported being able to use the confidence and skills possessed by Code Club children to support other pupils in lesson time.

The trial has also given us lots to work on. What do we mean by computational thinking and how do we best support volunteers and teachers to teach those concepts in an engaging way? How do we get better at managing the transition from visual to text-based programming languages? How can we most effectively identify and spread practice between Code Clubs? These are questions that are important not just for Code Club, but for the whole field of computer science education.

In just five years, Code Club has grown from a handful of clubs to over 5,000 Code Clubs in the UK, engaging over 75,000 children every week. It is also growing quickly around the world, with over 4,500 Code Clubs in dozens of countries. With the evidence of positive impact and the insights generated by this research, we are in a much stronger position to use that platform to build the skills and confidence that young people need to thrive in an increasingly digital world.

Philip Colligan
Chief Executive,
Raspberry Pi Foundation

Executive summary

1. Introduction

The National Foundation for Educational Research (NFER) completed a National Evaluation of Code Clubs on behalf of Code Club UK between June 2015 and September 2016.

Code Club UK is a nationwide network of after-school clubs for children aged nine to eleven, supported by volunteers. Code Club UK produces materials and projects that support the teaching of Scratch, HTML/CSS, and Python. The clubs usually run for one hour a week after school during term time and have around 15 children. The children learn to program by making games, animations, websites, and applications. Children gain skills that will be useful to them in their future hobbies, schooling, and career. It is hoped that children are inspired to pursue programming and other digital making activities in the future.

2. Evaluation aim

The aim of the evaluation was to assess the impact of attending Code Club on children's computational thinking, programming skills, and attitudes towards computers and coding more generally, through a randomised controlled trial (RCT) design. There was also an associated process evaluation.

As part of the RCT, schools were required to deliver their Code Club over three terms to pupils randomised to the intervention group. Drawing on freely available Code Club UK projects and notes for Code Club leaders, school leads were asked to deliver one term each of Scratch, HTML/CSS, and Python to pupils attending Code Club for the entire academic year. This was the specified model of delivery for the trial but many different models are used by schools, with some preferring to focus entirely on Scratch and to change their Code Club intake every term.

3. Evaluation design

Trial design

The trial used a pupil-randomised design to compare pupil outcomes in the intervention and control groups. Year 5 pupils signing up to attend Code Club within schools which agreed to take part in the trial were randomised into an intervention and control group. Intervention group pupils attended Code Club during the 2015/16 academic year whilst control group pupils continued as they would do normally.

However, control group pupils were assured of a place at Code Club the following academic year. The pupil-randomised design was chosen to maximise statistical power whilst keeping the number of schools needed realistic.

The primary outcome measure was the Bebras Computational Thinking Assessment, a 40-minute online quiz. This assesses children's computational thinking using a series of logic-based questions. It measures skills that Code Clubs aim to improve. It is, however, not closely associated with the delivery of Code Clubs, making it suitable for administration with both the intervention and control pupils.

Secondary measures included a Coding Quiz and Pupil Attitude Survey. The Coding Quiz measured children's understanding of key coding concepts through code comprehension, code completion, and debugging questions (using Scratch, HTML/CSS, and Python). This outcome assessment was more closely aligned with what is covered in Code Clubs. The Pupil Attitude Survey measured other potential key outcomes of Code Clubs such as increased general usage of computers, the development of skills related to coding (e.g. making and designing things with code and following instructions), transferable skills such as working with others, and future interest in coding and jobs that involve coding.

The final sample of pupils returning both baseline and endpoint assessments for the primary outcome measure was 317 (from 21 schools). Smaller numbers of pupils completed the secondary outcome assessments at both timepoints. A total of 252 pupils completed the Coding Quiz. For the attitude survey, the number completed was 165.

Process evaluation

All of the 21 schools who completed the baseline and endpoint assessments were consulted as part of the process evaluation, in addition to another school which completed the baseline but not the endpoint assessment. Fourteen teachers completed an online pro forma, with an additional eight teachers taking part in a telephone interview. The pro forma and interviews explored the progress of schools' Code Clubs over the academic year, including key success factors and any barriers encountered, as well as outcomes for pupils, teachers, and schools.

4. Key findings

Impacts

The findings from the analysis of pupils' scores at baseline and endpoint on the primary outcome measure, Bebras, indicated that **attending Code Club for a year did not have an impact on pupils' computational thinking over and above changes that would have occurred anyway**. However, it is worth noting that both the Code Club and control groups increased their scores on the Bebras assessment – an increase of around 16 points – between baseline and endpoint. This lack of impact of Code Club on pupils' computational thinking could be due to these skills already being developed through the normal computing curriculum in school and Code Club consolidating rather than further improving pupils' skills in these areas, or a year not being long enough for more significant changes to be seen. We also consider and discuss whether the assessment is sensitive enough to measure differences between the groups in section 5.1 of the main report, and we conclude that there is evidence that it is likely that it is a sensitive enough measure to detect differences if there were any.

However, as might be expected, **attending Code Club does significantly improve pupils' coding skills in Scratch, HTML/CSS, and Python**. This occurs even when control children are learning Scratch as part of the computing curriculum in school and some contamination may have occurred: the evaluation data suggests that some control group pupils may have been exposed to resources and approaches used in Code Club.

Pupils attending Code Clubs reported increased usage of all of the programming languages, with the largest increase being seen in the usage of Scratch, followed by HTML/CSS, and then Python. For example, the proportion of pupils reporting that they made things with Scratch 'every week' increased by 27 percentage points between baseline and endpoint. This reflects teachers' reports on pupils' relative enjoyment of the three languages and the difficulties they faced in using Python (and HTML/CSS to a lesser extent). Control pupils also showed an increase in their usage of Scratch – perhaps driven by their coverage of this as part of the computing curriculum in school – but not of the other two languages.

Attending Code Club for an academic year results in pupils' increased usage of computers, as well as positively impacting on how good they feel they are at making things with code. It also has a slight positive impact on their perceptions of how good they are at trying new challenges.

However, the data from the evaluation suggests that **attending Code Club for a year does not impact on pupils' perceptions of their abilities in a range of transferable skills**, such as following instructions and patterns, problem solving, learning about new things, and working with others.

Pupils' future interest in learning about coding and learning about coding languages were high for both the Code Club and control groups at both baseline and endpoint. At endpoint, two thirds or more of pupils in both groups reported that they were very interested/interested in learning about coding and learning about coding languages. In addition, just under half of both groups were interested in a job that involves coding at endpoint. However, Code Clubs were not shown to impact on these attitudes and, for all of these three questions, a slightly higher proportion of control group pupils were very interested/interested than Code Club pupils at endpoint and both groups were a little less positive at endpoint than at baseline.

Echoing pupils' own reports, **teachers reported a range of positive impacts for pupils, such as the development of confidence and skills in coding, IT, and using computers**. However, teachers also reported impacts on pupils' enthusiasm to continue learning code and their skills in collaborative working. This contrasts with reports from pupils, who might have rated their interest and skills lower in these areas, perhaps as a result of working at a higher level and being more aware of challenges and pitfalls. Teachers also reported pupils' increased skills in problem solving which was not borne out by pupils' reports and the Bebras assessment.

Regarding how long it takes for outcomes to be realised, there were mixed views. However, it seems that **early impacts on understanding concepts and developing confidence in coding can be seen at the end of the first term** as a result of pupils working with Scratch. However, **two to three terms are needed to see progress in terms of pupils working independently and having the resilience to work out problems for themselves**.

Although not a key focus of the evaluation, outcomes for teachers and schools were reported. **Teachers noted the development of their confidence and skills in coding. Schools had also benefitted from being able to utilise the skills of Code Club pupils in lessons to support those struggling with coding**. In addition, for many schools consulted, none of the outcomes above would have been realised without the trial as that had been the sole impetus for their club being set up.

Content and delivery

When asked if Code Club in the 2015/16 academic year had been delivered as required, half of the teacher consultees (11 out of 22) reported that it had and half that it had not. Half of the schools had covered all of the three programming languages but most had not covered all of the six units. The evaluation has found that, in the real world, Code Clubs are delivered in many ways and that schools often prefer to retain their focus on Scratch rather than moving to the other languages, which pupils can find more complex and less enjoyable.

The factor that was considered the most important for the successful running of Code Clubs was access to the Code Club UK projects and teacher notes. As might be expected, the engagement of pupils was also perceived to be of key importance as was having an enthusiastic volunteer – from within or outside school – to lead the club.

Some teachers reported difficulties in delivering Code Clubs due to insufficient time, technical issues, lack of knowledge of the languages, and pupil drop-out, though most reported that their club had run very smoothly this year.

5. Conclusion

Code Clubs can play an important role in improving pupils' coding skills in Scratch, HTML/CSS, and Python and their usage of these programming languages. They can also have a knock-on positive effect on pupils' confidence in using, and usage of, computers, as well as their perceptions of how good they are at making things with code. Teachers report that Code Club UK's projects are of high quality, clear, simple, and easy to deliver which makes setting up a Code Club – even for those staff with no prior experience of coding – relatively straightforward.

1. Introduction

This report presents the findings of the National Evaluation of Code Clubs which was undertaken by the National Foundation for Educational Research (NFER) on behalf of Code Club UK between June 2015 and September 2016.

1.1. Code Club UK

Code Club UK is a nationwide network of after-school clubs for children aged 9-11 years, supported by volunteers. The clubs are free for children to attend and for schools to host. Code Club UK produces materials and projects that support the teaching of Scratch, HTML/CSS, and Python. The clubs usually run for one hour a week after school during term time and have around 15 children. The children learn to program by making games, animations, websites and applications. Children gain skills that will be useful to them in their future hobbies, schooling, and career. It is hoped that children are inspired to pursue programming and other digital making activities in the future.

1.2. Evaluation aim

The aim of the evaluation was to assess the impact of attending Code Club on children's computational thinking and attitudes towards computers and coding more generally, through a randomised controlled trial (RCT) design. The associated process evaluation explored whether Code Clubs had been delivered as intended, key success factors, any barriers to delivery, and the perceived outcomes for pupils, teachers, and schools.

As part of the RCT, schools were required to deliver their Code Club over three terms to pupils randomised to the intervention group. Drawing on freely available Code Club UK projects and Notes for Club Leaders, school leads were asked to deliver one term each of Scratch, HTML/CSS, and Python to pupils attending Code Club for the entire academic year. This was the specified model of delivery for the trial but many different models are used by schools, with some preferring to focus entirely on Scratch and to change their Code Club intake every term.

1.3. Project team

Suzanne Straw was the Project Director responsible for all aspects of the project. Dr Ben Styles, a Research Director in NFER's Centre for Statistics, provided statistical consultancy on the project and ensured the RCT ran smoothly. Dr Susie Bamford was the project leader, responsible for the day-to-day running of the evaluation and leading on the statistical analysis. Taj Athwal, Joanne Haswell, and Kathryn Hurd were the key members of the Research and Product Operations Department. They carried out the sampling, recruitment, survey administration, data capture, and data production activities.

Chris Roffey provided and supported the Bebras Computational Thinking Assessment.

Code Club UK designed the Coding Quiz.

1.4. Trial registration

The trial was registered on the international standard randomised controlled trial number (ISRCTN) registry at **http://www.isrctn.com/ISRCTN17195519**

2. Research design

2.1. Impact evaluation

2.1.1. Trial design

The trial used a pupil-randomised design to compare pupil outcomes in the intervention group with pupil outcomes in the control group. Eligible pupils were randomised into one of two groups: pupils who attended Code Club and pupils who were not offered a place in Code Club and who continued as they would do normally. However, the pupils who were randomised to the control group were assured of a place at Code Club the following academic year.

The pupil-randomised design was chosen to maximise statistical power whilst keeping the number of schools needed realistic.

2.1.2. Outcome measures

The primary outcome measure was the Bebras Computational Thinking Assessment, a 40-minute online quiz. This assesses children's computational thinking using a series of logic-based questions. It measures skills that Code Clubs aim to improve, yet it is not closely associated with the delivery of Code Clubs, making it suitable for administration with both the intervention and control pupils.

Secondary measures were the Coding Quiz and the Pupil Attitude Survey.

The Coding Quiz was designed by Code Club UK and validated by NFER. It measured children's ability to understand key coding concepts through code comprehension, code completion, and debugging questions (using Scratch, HTML/CSS, and Python). This outcome assessment was more closely aligned with what is covered in Code Clubs.

The Pupil Attitude Survey was developed by NFER. It measured other potential key outcomes of Code Clubs such as increased general usage of computers, the development of skills related to coding (e.g. making and designing things with code and following instructions), transferable skills such as working with others, and future interest in coding and jobs that involve coding.

2.1.3. Participant selection

Schools which had sufficient numbers of Year 5 pupils, and the resources to run a Code Club, were eligible to be recruited. All Year 5 pupils who showed an interest in Code Club were eligible for participation in the trial.

A sample of 345 schools was approached initially by email, letter and phone, in order to secure the 35 schools we intended to recruit. Within this sample, we had three sub-samples, as detailed below.

1. We contacted 45 schools who had agreed to take part in the study at the end of 2014 when Code Club UK was first setting up the evaluation.
2. We matched the list of existing schools running Code Clubs to NFER's Register of Schools and we drew a sample of 200 larger schools (with two or three form entry).
3. An additional sample of 100 larger schools (those with two or three form entry) was drawn from the list of schools that had expressed an interest in running a Code Club but had not yet set one up.

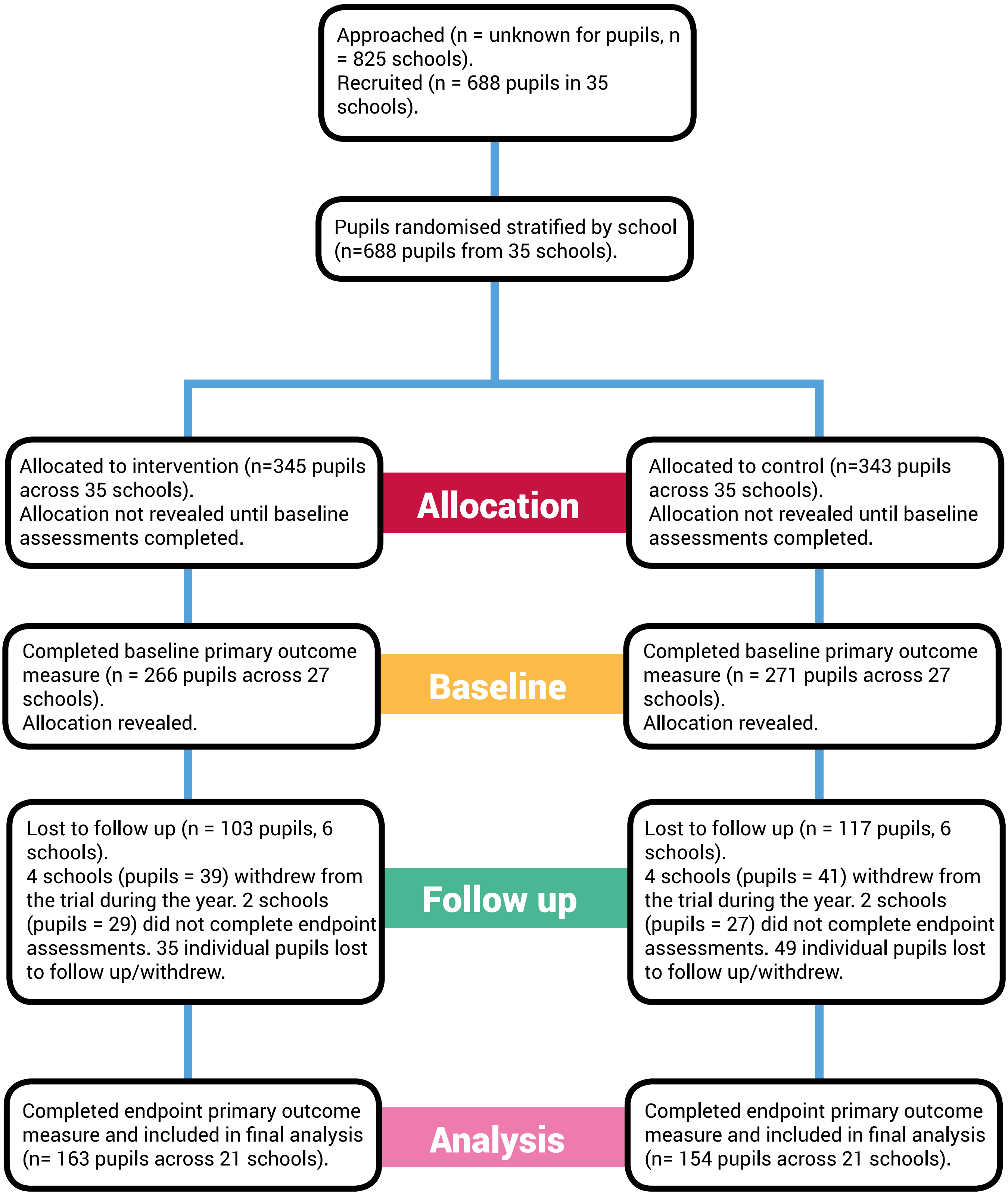
Despite contacting these 345 schools, we did not have sufficient interest from schools to meet our target (only 15 schools from these three samples expressed an interest in the RCT). We therefore drew and approached an additional sample of schools. This included 386 schools who already had a Code Club and a further 94 schools who did not have a Code Club. So, in total, we contacted 825 schools and, from this, we received expressions of interest from 48 schools. Thirty-five schools then went on to enter the trial and underwent randomisation. However, 27 schools completed all the necessary baseline assessments and so the final number starting the trial was 27. Recruitment began in April 2015 and continued until the end of July 2015.

Reasons for not participating in the trial at the outset were the lack of a member of staff or volunteer to deliver the club, insufficient interest from children, and lack of parental buy-in to the trial design.

The flow diagram over the page provides details of the recruitment and randomisation process and the numbers of schools and pupils taking part in the trial and completing the primary outcome assessment – Bebras – at baseline and endpoint. Further details on sampling and randomisation, including the numbers of pupils completing the baseline and endpoint assessments for the secondary outcome assessments – the Coding Quiz and the Pupil Attitude Survey – can be found in sections 2.1.4 and 2.1.5.

Flow diagram of recruitment and randomisation and numbers completing the primary outcome assessments at baseline and endpoint

*The letter ‘n’ in the flow diagram indicates the number of items (pupils/schools).



2.1.4. Sample size

The aim at the outset of the study was to recruit 600 pupils and allocate 300 to each group in the trial. This would allow the detection of an effect size of 0.17, at 80 per cent power assuming a pre-post test correlation of 0.7. This is adequate for interventions that are directed specifically at children, such as Code Club.

The final sample of recruited pupils was 688 (from 35 schools). The number that went on to complete the baseline assessment and enter the trial was 537 (from 27 schools). The final sample returning both baseline and endpoint assessments for the primary outcome measure was 317 (from 21 schools). Smaller numbers of pupils completed the secondary outcome assessments at both timepoints. For the Coding Quiz, a total of 252 pupils completed it. For the attitude survey, the number was 165.

Most of the drop-out was whole-school drop-out. Four schools dropped out of the trial during the academic year due to issues in running the club, in particular a lack of staffing. Two other schools ran their club for the entire year but were lost at endpoint as they failed to complete the Bebras assessment. These schools were given extra time to complete the assessments, reminded by phone and email, and offered extra support, but were still unable to achieve this and so effectively they removed themselves from the trial. In some schools, a smaller numbers of pupils completed the endpoint assessment than completed the baseline. Although schools were asked to complete the endpoint assessment with all pupils - even those who had dropped out of Code Club - some schools only administered the endpoint assessment with pupils continuing for the full academic year.

2.1.5. Randomisation

Pupils were randomised to one of the two groups. The randomisation was stratified by school with an equal allocation to each group within each school (even numbers permitting). Children randomised to the Code Club group went on to attend an academic year of Code Club and children randomised to the control group continued with business as usual (but with a promise that they would be able to attend Code Club the following academic year).

Randomisation was carried out on a pre-defined date by which time all pupils in the recruited schools were required to have completed their baseline Bebras assessment. Some schools missed this deadline but were still keen to take part so it was decided that randomisation would go ahead on the pre-planned date but schools would not be informed of their pupils' individual allocations until they had completed their assessments. In this way, alterations were made to the plan to suit the schools whilst still preventing bias.

The syntax for randomisation was written by Dr Ben Styles and checked by Dr Susie Bamford. Six hundred and eighty-eight pupils (from 35 schools) were randomised with 345 in the intervention and 343 in the control group. Twins were randomised as a single unit.

As mentioned above, a number of these schools did not complete the Bebras baseline assessment despite intending to do so. This left 537 pupils (from 27 schools) who completed the baseline Bebras assessment and continued into the trial. Of these, 266 were in the intervention and 271 in the control group.

2.1.6. Analysis

Analysis to determine the impact of Code Club on the primary outcome measure of the Bebras assessment used a regression model that included baseline as a covariate and adjusted for school since randomisation was restricted by school. This standard statistical analysis procedure maximises power and addresses any chance imbalance at baseline. The Coding Quiz outcomes were analysed in a similar way. These analyses estimate the average difference in the main outcome measures between the intervention and control groups. Basic descriptive analysis was undertaken for the Pupil Attitude Survey data, comparing participants' attitudes at baseline and follow up.

2.2. Process evaluation

2.2.1. Methods and sample

A total of 22 teachers from 23 schools[1] which ran their Code Club for the full academic year took part in the teacher consultation. Two of these 23 schools did not go on to administer the pupil endpoint assessments and so their pupil data was not included in the outcome analysis. This meant that all of the 21 schools who completed the baseline and endpoint assessments were consulted, in addition to another school which completed the baseline assessments and ran their Code Club for the academic year but did not complete the endpoint assessments.

Fourteen teachers completed an online pro forma. Of these, half were ICT/computing leads and the rest were class teachers and senior leaders, with one being a teaching assistant. Half of these schools had started running their Code Club in September 2015 (many were set up as a result of the trial), whilst the other half had been running their club between one and three years. All had been involved in their club since its inception. The vast majority – ten respondents – were running their club on their own whilst four were running it with other teachers including the shadow ICT

[1] As noted previously, 27 schools completed the baseline assessments with 4 dropping out during the year and 2 schools not completing the endpoint assessments.

lead. Only one reported having the support of a volunteer from outside the school. Those who were supported reported that the role of other teachers and volunteers was to support with, and guide, the coding and help with technical issues.

An additional eight teachers took part in a telephone interview. Of these, six were computing leads/coordinators, the ICT support manager, or were responsible for developing technology across the curriculum (most were also class teachers); one was a teaching assistant; and one was a head teacher (another teacher in this school had run Code Club). All of these clubs had been set up in September 2015. All but one had been set up as part of the trial, with one consultee reporting that the letter about the trial gave the club some impetus but it would have still run. Four consultees were running their club alone with no support: one had wanted a volunteer but no-one had been identified and another had taken over from another teacher who had been promoted. Two consultees were running their club with the support of an ICT lead/digital leader, with the head teacher having close oversight of one of these clubs. Another consultee was running the club with a computing teacher trainee and another was supporting an external volunteer who was leading the club. This teacher was dealing with behaviour management but was also gaining professional development from observing the volunteer and accessing resources and materials.

The pro forma and interviews explored the progress of schools' Code Clubs over the academic year, including key success factors and any barriers encountered, as well as outcomes for pupils, teachers and schools.

2.2.2. Analysis

The interviews with teachers were transcribed. The in-depth qualitative data from both sources was analysed thematically. The small number of quantitative rating and ranking questions in the pro forma were also analysed, but the small numbers do not allow for robust statistical analysis.

2.3. Timeline

The timeline for the evaluation is shown below.

Table 1: Evaluation timings

Time	Activity
April to July 2015	School recruitment. Pupil data uploaded to NFER via secure portal.
September 2015	Baseline assessments. Randomisation by NFER statisticians. Group allocation revealed to schools. Delivery of intervention begins.
October 2015	Baseline results collated and analysed.
November 2015	Interim report delivered to Code Club UK.
May to June 2016	Qualitative interviews undertaken and proforma live.
June to July 2016	Endpoint assessments administered.
August to September 2016	Data collated, cleaned, and analysed. Control pupils offered Code Club.
October to December 2016	Final reporting.


Poetry
World of Faiths
LOOKING AT CHRISTIANITY
Christian

3. Impact evaluation

3.1. Participants

Twenty-one schools provided both baseline and endpoint pupil assessments and so the final analysis was completed on the data from these schools. A total of 317 pupils within these schools completed these two assessments.

3.2. Pupil characteristics

3.2.1 Bebras assessment

Of those 317 pupils completing both baseline and endpoint assessments, 163 (51 per cent) were in the Code Club group and 154 (49 per cent) were in the control group. Of these 317 pupils, 138 were girls and 179 were boys. So, the overall split of gender was 44 per cent female and 56 per cent male. Within the treatment and control groups, this split remained. In the Code Club group, 45 per cent of participants were female and 55 per cent male. In the control group 42 per cent were female and 58 per cent male.

3.2.2. Coding Quiz

Two hundred and fifty-two pupils completed the Coding Quiz at both baseline and endpoint. Of these, 138 (55 per cent) were in the Code Club intervention group and 114 (45 per cent) were in the control group. Forty-three per cent were female and 57 per cent male.

3.2.3. Pupil Attitude Survey

One hundred and sixty-five pupils completed the Pupil Attitude Survey both at baseline and endpoint. Of these, 91 were in the Code Club intervention group (55 per cent) and 74 (45 per cent) were in the control group and 92 (56 per cent) were male and 73 (44 per cent) were female.

3.3. Outcomes and analysis

The sections below explore the findings of the three baseline and endpoint assessments. For details of the statistical analysis performed, please see Appendix A.

3.3.1. Bebras assessment

Pupils' overall scores in the Bebras

At baseline, pupils scored an average of 36.99 out of a possible 117 points (i.e. 31.6 per cent) on the Bebras. At endpoint, both the Code Club and control groups had increased their scores by around 16 points so they were now performing around the 45 per cent mark. So, both groups showed an improvement in their computational thinking. However, although the Code Club pupils had higher minimum and maximum scores than the control group, the means for both groups at endpoint were similar. Further details are provided in Table 2 and the analysis section below.

Table 2: Pupils' Bebras scores

Bebras Score	Mean	Standard deviation (SD)	Minimum score (out of 117)	Maximum score (out of 117)	Number of pupils
Baseline	36.99	18.20	5	90	317
Endpoint control	52.29	16.52	5	95	154
Endpoint Code Club	53.71	17.89	17	101	163

Analysis

As shown in Table 2 above, mean scores on the Bebras assessment for the Code Club pupils and the control group pupils were very similar, with control group pupils having an average score of 52.29 (SD 16.52) and Code Club pupils having an average score of 53.71 (SD 17.89). The analysis revealed that attendance at Code Club was not a significant predictor of score on the Bebras, $t = 0.51$, $p > .05$. This means that **there was no evidence that attending Code Club had any effect on children's computational thinking at the end of their academic year attending Code Club over and above changes that would have occurred anyway**. The analysis showed that the consequence of being in the Code Club group as opposed to the control group was only equivalent to an increase of 0.93 (-2.65, 4.51) score points, on average, in the Bebras assessment.

As highlighted above, both groups showed similar increases in their Bebras scores between baseline and endpoint with no significant difference being found between the groups. This lack of impact of Code Club on pupils' computational thinking could be due to computational thinking skills already being developed through the normal computing curriculum in school and Code Club consolidating rather than further improving pupils' skills in these areas, or a year not being long enough for more significant changes to be seen. We also consider and discuss whether the assessment is sensitive enough to measure differences between the groups in section 5.1, and we conclude that there is evidence that it is likely that it is a sensitive enough measure to detect differences if there were any.

[1] As noted previously, 27 schools completed the baseline assessments with 4 dropping out during the year and 2 schools not completing the endpoint assessments.

3.3.2. Coding Quiz

Pupils’ overall scores in the Coding Quiz

At baseline, pupils scored an average of 3.48 points out of a possible total of 22 (i.e. 15.8 per cent). It was expected that pupils would perform poorly at this stage as they had not been exposed to much coding or to Code Club activities. At endpoint, the pupils in the control group performed similarly to their scores at baseline with a comparable mean (17 per cent correct) and range of minimum and maximum scores. The Code Club pupils improved their mean score (25 per cent correct) and increased their maximum score to 15. Further details are provided in Table 3 and the analysis section below.

Table 3: Pupils’ Coding Quiz scores

Total score Quiz	Mean	Standard deviation (SD)	Minimum score (out of 22)	Maximum score (out of 22)	Number of pupils
Baseline	3.48	1.87	0	9	252
Endpoint control	3.81	1.82	0	8	114
Endpoint Code Club	5.60	2.60	0	15	138

Analysis

Mean scores on the Coding Quiz for the Code Club pupils and the control group pupils did differ, with control group pupils having an average score of 3.81 (SD = 1.82) and Code Club pupils having an average score of 5.60 (SD = 2.60). The analysis revealed that attendance at Code Club did significantly predict score on the Coding Quiz $t = 5.17$, $p < .001$. This means that, **after attending an academic year of Code Club, pupils demonstrated better coding skills in Scratch, HTML/CSS, and Python than the pupils who were in the control group** and received only business as usual coding lessons as part of their normal curriculum. This improvement (the increase in score by being in the Code Club as opposed to the control group) was equivalent to 1.49 (0.92, 2.05) score points, on average, in the Coding Quiz.

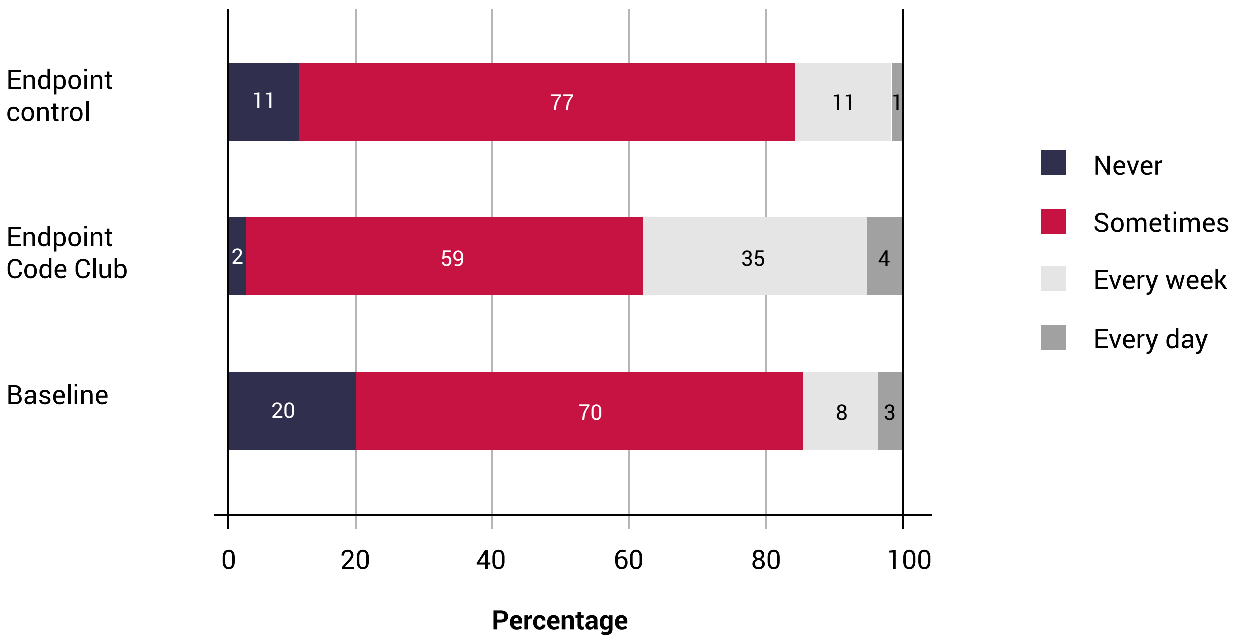
Pupils' reports on their usage of programming languages

As part of the Coding Quiz, pupils were also asked questions about how often they used each programming language and what activities they undertook. As might be expected, there was an increase in the proportion of Code Club pupils reporting usage of all of the programming languages. Control group pupils generally reported little change from the baseline, with the exception of Scratch where more pupils reported using it at endpoint. This is likely to be due to them learning about Scratch as part of their normal curriculum in primary school. For both groups, the usage of Scratch was greatest, followed by HTML/CSS and Python at both baseline and endpoint. Further details are provided below.

Between baseline and endpoint, there was an increase in the proportion of Code Club pupils reporting that they made things with Scratch 'every week' (an increase of 27 percentage points), alongside a reduction in the proportion of Code Club pupils reporting that they 'never' made things with Scratch (a reduction of 18 percentage points).

At endpoint, **there were slight increases seen in the proportion of control group pupils making things with Scratch 'sometimes'** (an increase of seven percentage points from the baseline) **and 'every week'** (an increase of three percentage points). This was presumably related to Scratch being covered in normal lessons throughout the year, as part of the new primary computing curriculum. The results are presented in Chart 1 below.

Chart 1: How often do you make things with Scratch?



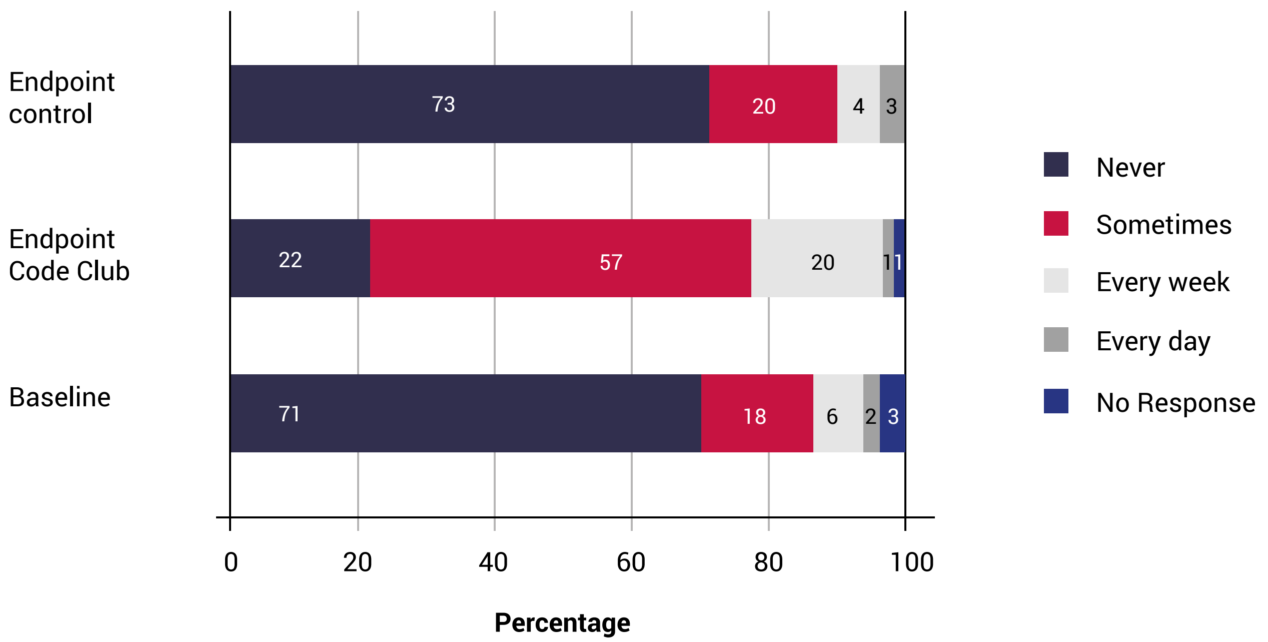
Source: NFER and Code Club UK Coding Quiz, Sept 2015, and June/July 2016. N = 252. Baseline total N = 252, Endpoint Code Club N = 138, Endpoint control N = 114. Due to rounding percentages may not sum to 100.

Pupils from both groups reported that they mostly used Scratch to make games, followed by animations. Smaller numbers reported that they used it for music and art.

Between baseline and endpoint, there was an increase in the proportion of Code Club pupils reporting that they made things with HTML/CSS 'sometimes' and 'every week'. In particular, there was a large increase in the proportion of pupils reporting that they made things with HTML/CSS 'sometimes' (an increase of 39 percentage points) and a smaller proportion reporting that they made things using this language 'every week' (an increase of 14 percentage points).

The pupils in the control group retained a similar pattern at endpoint to their responses at baseline, with a high proportion at endpoint (73 per cent) reporting that they had 'never' made things with HTML/CSS. The results are presented in Chart 2 below.

Chart 2: How often do you make things with HTML/CSS?



Source: NFER and Code Club UK Coding Quiz, Sept 2015, and June/July 2016. N = 252. Baseline total N = 252, Endpoint Code Club N = 138, Endpoint control N = 114. Due to rounding percentages may not sum to 100.

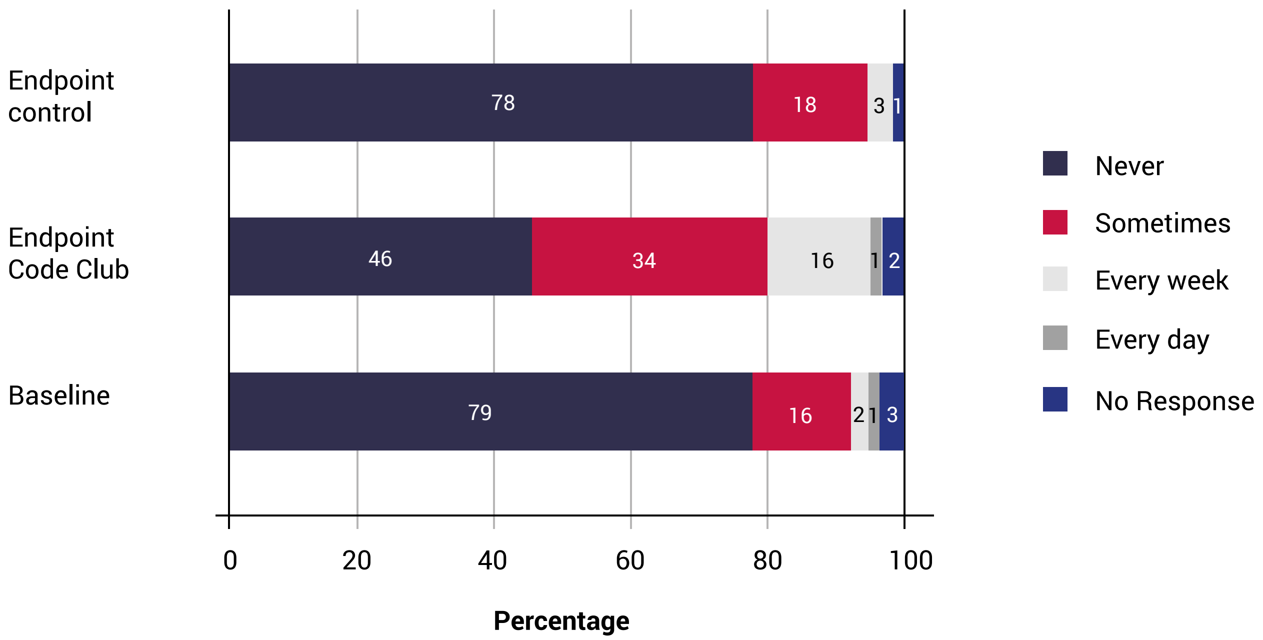
Pupils from both groups reported that **they made different types of web pages using HTLM/CSS**. The most common were web pages using colour, font, and other styles and web pages using images. This was followed by text-based web pages. Smaller numbers made web pages with hyperlinks and web pages using video and sound.

Between baseline and endpoint, there was a reduction in the proportion of Code Club pupils reporting that they had 'never' made things with Python (a reduction of 33 percentage points). Conversely, **there was an increase in Code Club pupils reporting that they made things with Python 'sometimes'** (an increase of 18 percentage points) **and 'every week'** (an increase in 14 percentage points).

The control group pupils retained a similar pattern at endpoint to baseline, with the vast majority (78 per cent) reporting that they had 'never' made things with Python.

The results are presented in Chart 3 below.

Chart 3: How often do you make things with Python?



Source: NFER and Code Club UK Coding Quiz, Sept 2015, and June/July 2016. N = 252. Baseline total N = 252, Endpoint Code Club N = 138, Endpoint control N = 114. Due to rounding percentages may not sum to 100.

The Code Club pupils who reported using Python were mostly using it to make text-based and picture-based programmes, with graphic-based programmes rarely made. Very small numbers of control pupils reported using Python to make these three types of programmes.

3.3.3. Pupil Attitude Survey

The Pupil Attitude Survey administered at baseline and endpoint with 165 pupils built on the data gathered on pupils' coding activity explored via the Coding Quiz. It explored changes from the baseline in both Code Club and control group pupils in terms of:

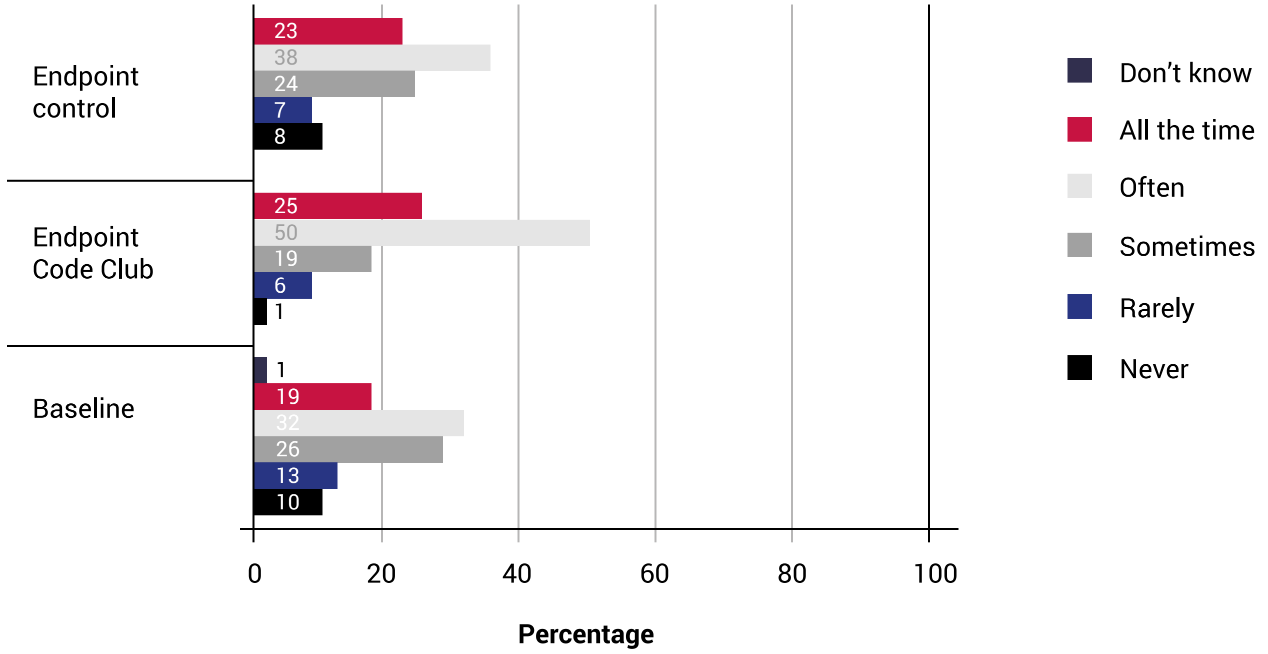
- general usage of computers
- pupils' views on their abilities in a range of areas which could have been impacted by attending Code Club, such as making and designing things with code; following instructions, problem solving, finding errors, and reviewing work; working with other pupils; learning about new things and trying new challenges
- future interest in coding and jobs that involve coding.

The findings are detailed below. It is worth noting that these findings should be treated with some caution due to the small number of pupils completing the survey overall and in each of the two groups (i.e. intervention and control).

General usage of computers

Findings from the Pupil Attitude Survey suggested that attending Code Club does not just impact on pupils' usage of coding languages but also on their usage of computers more generally. At endpoint, **a higher proportion of pupils in Code Clubs reported that they used computers 'often'** (50 per cent) compared to control group pupils (38 per cent) and the baseline position for both groups (32 per cent). A similar proportion of Code Club pupils and control group pupils used computers all the time (25 per cent and 23 per cent respectively). The results are presented in Chart 4 below.

Chart 4: Pupils' use of computers



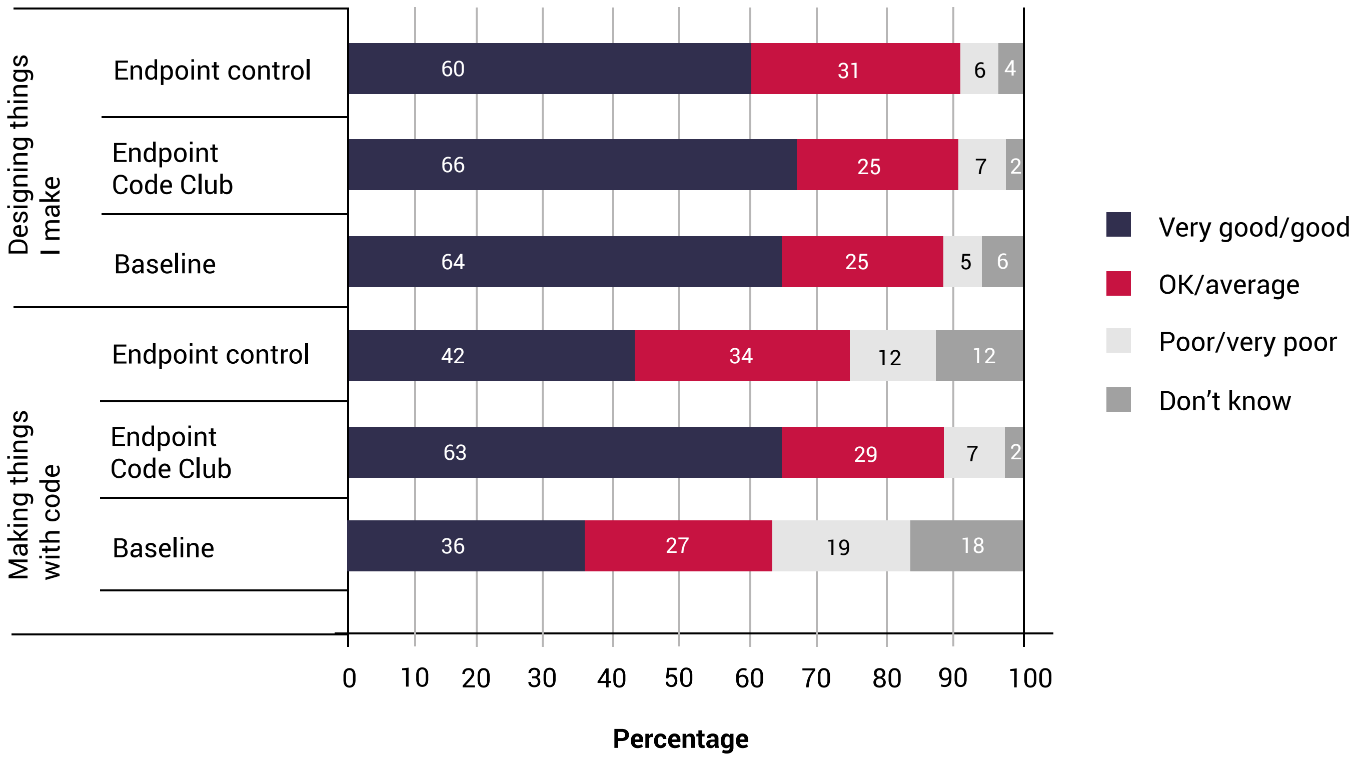
Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

Making and designing things with code

As might be expected due to it being a key focus of Code Clubs, **at endpoint a much higher proportion of Code Club pupils (63 per cent) compared to control group pupils (42 per cent) and the baseline (36 per cent) reported that they were very good/good at making things with code**.

The difference in terms of designing things with code was much smaller (66 per cent of Code Club pupils compared to 60 per cent of control group pupils and a baseline of 64 per cent reported that they were very good/good at designing things with code). The results are presented in Chart 5 below.

Chart 5: Pupils' views on their skills in making and designing things with code



Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

Following instructions, solving problems, finding errors, and reviewing work

In terms of following instructions and patterns, solving problems, finding errors and correcting them, and checking and improving work, Code Club pupils did not feel that they had become better at these activities. Instead, the proportion of Code Club pupils reporting that they were very good/good at these activities was either the same or lower at endpoint than at baseline. In addition, for three of these activities, higher proportions of control pupils than Code Club pupils reported that they were very good/good at them. One possible explanation of these findings is that Code Club pupils were undertaking these activities more frequently and at a higher level and were, as a result, better able to assess their skills and were more aware of the difficulties and challenges that can be encountered. However, it is worth noting that the Bebras assessment did not detect any improvements in pupils' computational thinking which corroborates these findings.

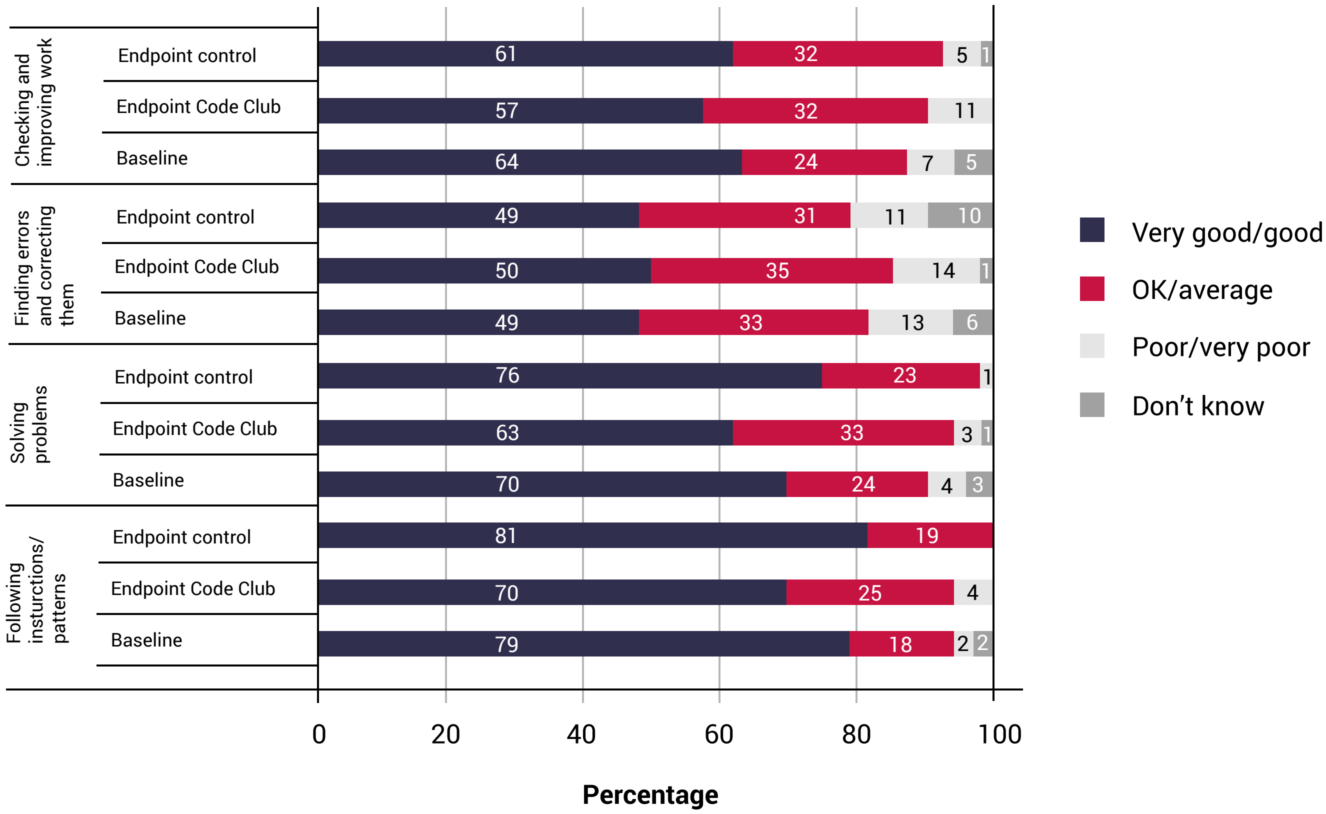
More specifically:

- 70 per cent of Code Club pupils reported that they were very good/good at following instructions/patterns at endpoint compared to 81 per cent of control group pupils and the baseline of 79 per cent

- 63 per cent of Code Club pupils reported that they were very good/good at solving problems at endpoint compared to 76 per cent of control group pupils and the baseline of 70 per cent

There were only small differences between the two groups and the baseline position in the other two areas, with no or little positive change from the baseline as indicated in Chart 6 below.

Chart 6: Pupils' views on their skills in following instructions, solving problems, finding and correcting errors, and checking and improving work



Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

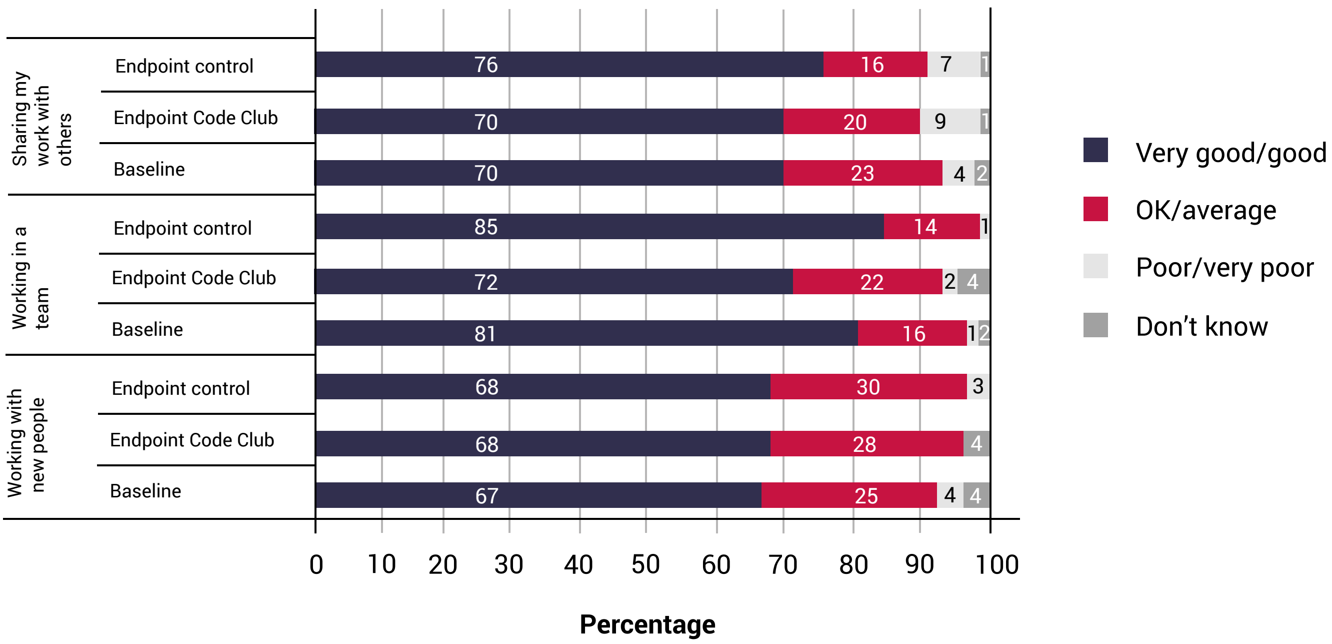
Working with other pupils

In terms of pupils' assessment of how effective they were in working with new people, working in a team and sharing their work with others, again, Code Club pupils did not feel that they had become better at these activities following attendance at Code Club. Furthermore, in terms of working in a team, they were more negative about their abilities: at endpoint 72 per cent of Code Club pupils reported that they were very good/good at this activity compared to the baseline position of 81 per cent.

In addition, at endpoint, slightly higher proportions of control pupils than Code Club pupils reported that they were very good/good at two of these areas: working in a team (85 per cent as opposed to 72 per cent) and sharing their work with others (76 per cent as opposed to 70 per cent). The results are presented in Chart 7 below.

Again, one possible explanation of these findings is that Code Club pupils were undertaking these activities more frequently and were, as a result, better able to assess their skills and were more aware of the difficulties and challenges that can be encountered. However, further data to explain these findings would need to be collected to explore these findings further.

Chart 7: Pupils' views on their skills in working with others



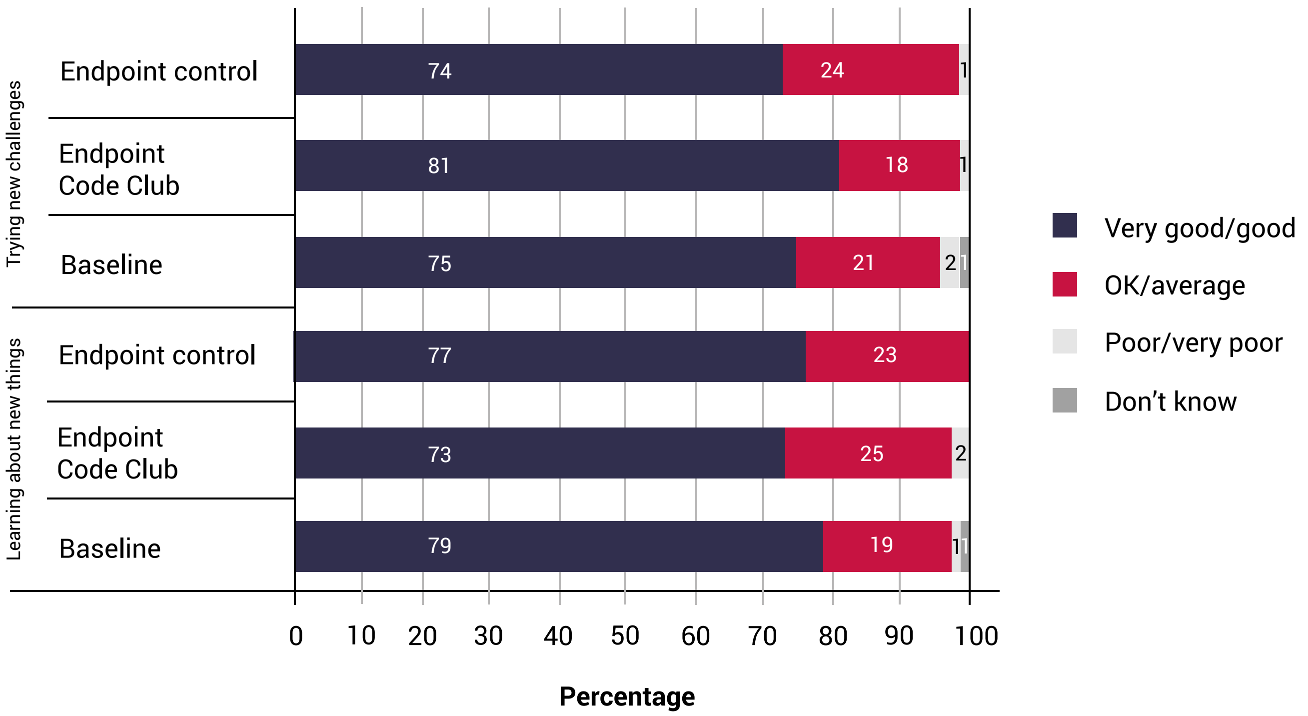
Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

Interest in learning about new things and trying new challenges

In terms of learning about new things and trying new challenges, there was a mixed picture and little difference between the two groups at endpoint and little movement from the baseline. This, again, suggests that these areas are not impacted by pupils' attendance at Code Club.

At endpoint, **a slightly higher proportion of Code Club pupils than control group pupils and the combined baseline group reported that they were very good/good at trying new challenges** (81 per cent of the Code Club pupils reported this compared to 74 per cent of the control group and 75 per cent of the combined baseline group). However, **the proportion of Code Club pupils reporting that they were very good/good at learning about new things at endpoint was slightly lower than that of the control group and the baseline group** (73 per cent compared to 77 per cent and 79 per cent respectively). The results are presented in Chart 8 below.

Chart 8: Pupils' interest in learning about new things and trying new challenges



Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

Future interest in coding

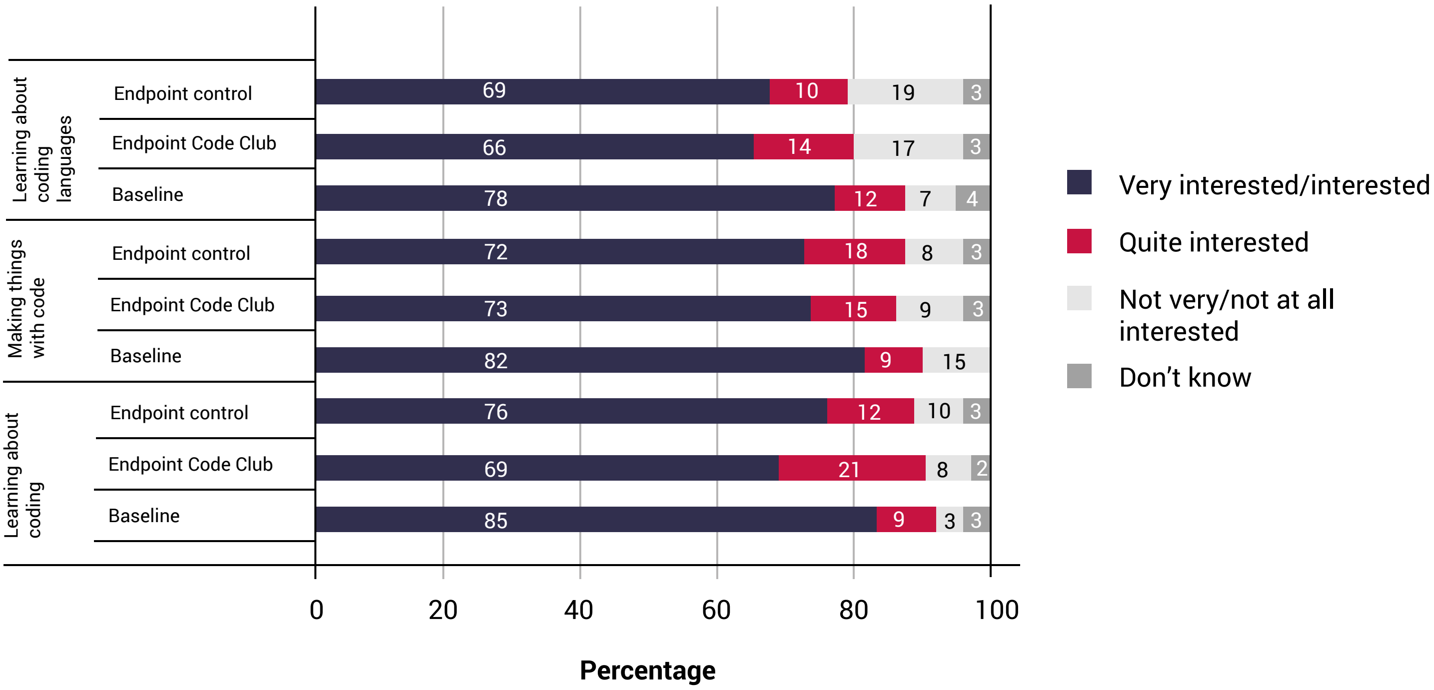
Interestingly, Code Clubs do not seem to impact on pupils' future interest in learning about coding and learning about coding languages. **At endpoint, Code Club pupils were a little less interested in learning about coding and learning about coding languages than the control group pupils and the combined baseline group**. This may be related to the difficulties the Code Club pupils have experienced in using HTML/CSS and Python (reported in the teacher consultations) and the fact that smaller numbers of control club pupils will have been exposed to these more challenging languages. However, it is worth noting that, having said this, the interest of Code Club pupils in learning about coding and learning about coding languages was still high at endpoint, with two-thirds or more being very interested/interested in learning about these areas.

In terms of making things with code, similar proportions of Code Club and control group pupils reported that they were very interested/interested in doing this as indicated in Chart 9 below.

More specifically:

- 69 per cent of Code Club pupils compared to 76 per cent of control group pupils and the baseline of 85 per cent reported that they were very interested/interested in learning about coding
- 66 per cent of Code Club pupils compared to 69 per cent of control group pupils and the baseline of 78 per cent reported that they were very interested/interested in learning about coding languages
- 73 per cent of Code Club pupils compared to 72 per cent of control group pupils and the baseline of 82 per cent reported that they were very interested/interested in making things with code

Chart 9: Pupils' future interest in coding



Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

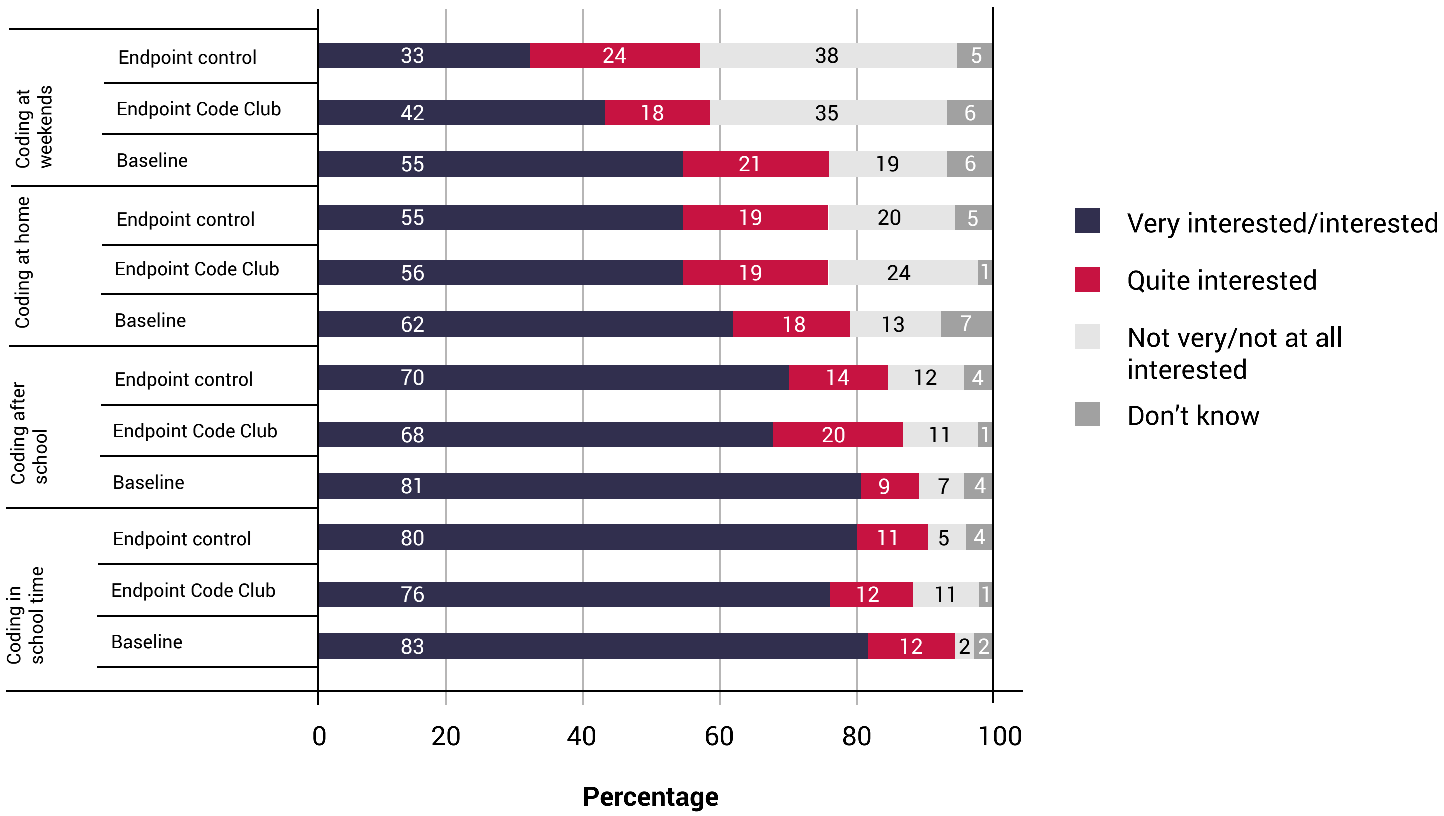
There was also little difference between Code Club and control pupils in terms of their interest in coding in or outside school. As Chart 10 indicates, high proportions of both were very interested/interested in coding during school time or after school and there was a little less interest in coding at home and even less interest in coding at the weekend. **However, control group pupils were a little more interested in coding in school time or after school, whilst Code Club pupils were more interested in coding at the weekend.** The interest of control groups in coding at school might relate to them having been denied Code Club for a year and being keen to start attending in the next academic year.

More specifically:

- just over three-quarters of both groups (76 per cent of Code Club pupils and 80 per cent of control group pupils) were very interested/interested in coding in school time which was a small decrease from the baseline of 83 per cent
- just over two-thirds of both groups (68 per cent of Code Club pupils and 70 per cent of control group pupils) were very interested/interested in coding after school which was a decrease from the baseline of 81 per cent

- just over a half of both groups (56 per cent of Code Club pupils and 55 per cent of control group pupils) were very interested/interested in coding at home which was a slight decrease from the baseline of 62 per cent
- less than half of both groups (42 per cent of Code Club pupils and 33 per cent of control group pupils) were very interested/interested in coding at the weekend which was a decrease from the baseline of 55 per cent)

Chart 10: Pupils' interest in coding at/outside school



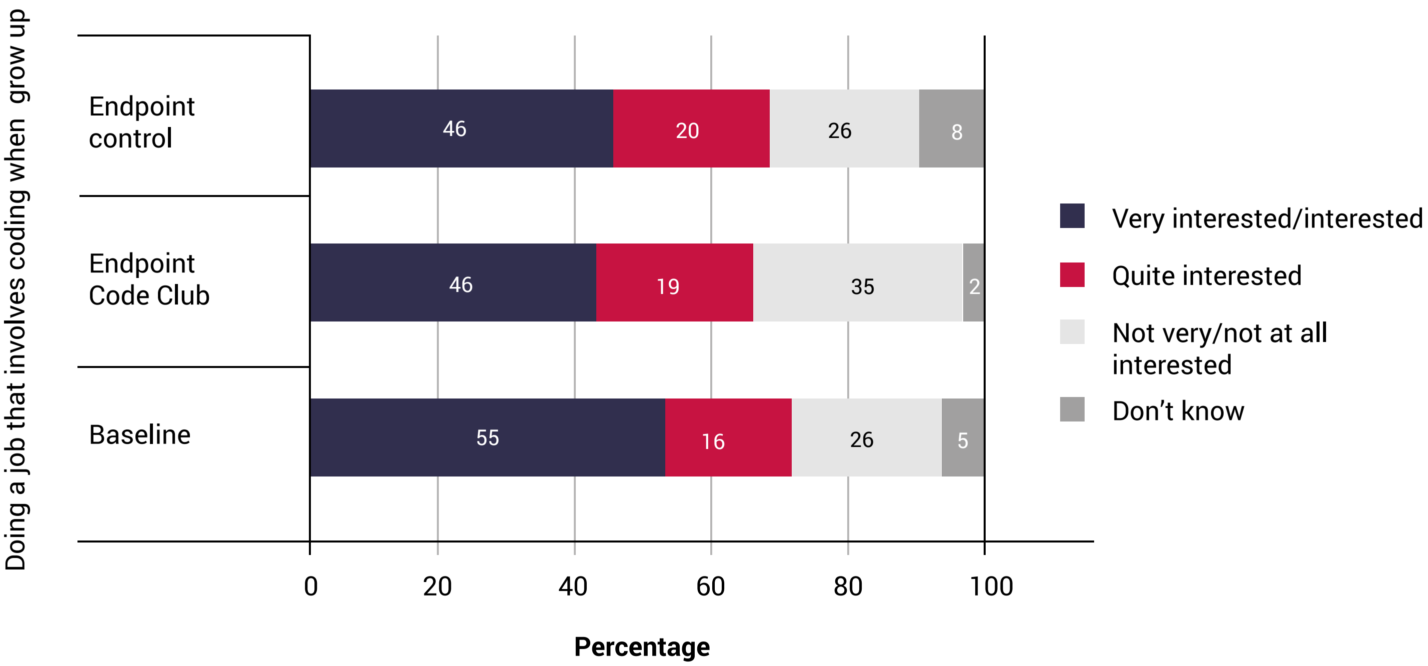
Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

Interest in a job that involves coding

Finally, attendance at Code Club does not seem to impact on pupils' interest in a job that involves coding, although a good proportion demonstrated an interest in this job at endpoint. As Chart 11 indicates, for this question, there was no difference between the groups at endpoint and a decrease from the baseline position. Just less than half of both groups (44 per cent of Code Club pupils and 46 per cent of control group pupils) were very interested/interested in a job that involved coding, which was a decrease from the 55 per cent who reported this at baseline.

We might expect Code Club pupils to be more interested in coding but understanding more about coding and some of the challenges involved could have worked both ways i.e. in motivating pupils and in putting them off coding. However, it is also worth noting that, over the year, the interest of both groups in a job that involves coding declined. This might be due to both gaining a greater understanding of the challenges involved in coding over the normal course of their studies i.e. in normal Scratch lessons and/or having learnt more about other career options over the year.

Chart 11: Pupils' interest in a job involving coding



Source: NFER Pupil Attitude Survey, September 2015 and June/July 2016. N = 165. Baseline total N = 165, Endpoint Code Club N = 91, Endpoint control N = 74. Due to rounding percentages may not sum to 100.

4. Process evaluation

This section details the findings of the process evaluation which included the administration of a pro forma and interviews with a total of 22 staff running Code Clubs, who were all from different schools. Fourteen staff completed an online pro forma, whilst an additional eight staff took part in a telephone interview. Details on the roles of these staff, and the support they had in running their Code Club, are presented in 2.2.1.

4.1. Content and delivery of Code Clubs

4.1.1 Usage of Code Club UK projects and other resources

All of the teachers consulted had used Code Club UK projects and most had also used Notes for Club Leaders in their delivery of Code Club. In addition, five had undertaken online training; five had read newsletters, blogs and social media posts; and one had used the frequently-asked questions. Some consultees also mentioned downloading certificates for pupils. Four consultees also reported using additional resources such as LEGO coding equipment, Hour of Code, Kodu, Drones, micro:bits and Spheros and websites such as Web Monkey. One consultee reported undertaking a MOOC on Scratch prior to the trial and to have since done another MOOC on using technology effectively with primary pupils.

The teachers who had more expertise in coding and computing relied a little less on the Code Club UK resources and devised their own lesson plans. Those who had no or little coding expertise tended to only use the Code Club UK resources. Only one school involved in the consultation was supported by an outside volunteer who led the club and used other resources.

4.1.2 Was Code Club delivered to plan?

When asked if their Code Club this year had been delivered as was expected by the trial, half of the pro forma respondents reported that it had and half that it had not. In addition, all but one of those who were interviewed had delivered the club as planned. Reasons for not running the club as planned varied and included:

More specifically:

- insufficient time to cover all three languages

- pupils’ limited knowledge on starting which meant that more time was spent on Scratch to ensure a full understanding
- the Club leader allowing the children to lead the club who chose to mainly stay with Scratch for the whole year
- disappointment in Trinket not working (although this school reported that the problem had now been overcome and the school planned to use Notepad ++ next year)
- staffing issues
- software issues – e.g. getting content loaded onto machines did not always work
- not always having the required resources in school or fewer resources than was envisaged on the Code Club UK website
- children dropping out to pursue other interests or leaving the school.

In terms of implications for the trial, this finding means that the trial has measured the impact of a range of approaches to running Code Clubs rather than the impact of the trial’s proposed model of running Code Club. There are many other models of running Code Clubs that are used beyond the trial, including those led by volunteers rather than teachers.

4.1.3. Coverage of the three programming languages

In terms of Code Club leaders’ coverage of the three programming languages:

- **half of the 22 respondents (11) had covered all of the programming languages during the last academic year**. However, they had not all covered all of the six units
- **all consultees reported covering Scratch**, with most, but not all, covering both Scratch 1 and 2. Four also reported covering additional Scratch projects
- **17 consultees had covered HTML/CSS 1**, with nine progressing to HTML CSS 2
- **just over half (12 consultees) had covered Python**. Of these, all 12 had covered Python 1 with a smaller number – three – moving onto Python 2.

In some cases, children had been able to progress at their own pace which meant that some children completed more units than others.

Where Code Club leaders had not covered all of the languages and units it was mainly due to time issues in covering, or preparing to cover the languages, or limited knowledge of the leader, rather than lack of pupil interest. Reasons given in descending order of mention include:

- **insufficient time to cover all of the languages/units** – some consultees reported that the trial assessments encroached on club time
- **limited knowledge of some languages**
- **insufficient time to undertake the preparation required for some languages**
- **leaders not having the necessary software or experiencing issues with the language** (e.g. Trinket in HTML)
- **change of staffing** with Code Club not running for a few weeks whilst a new staff member was identified to run the club
- **children not being interested in some languages or finding them too difficult or not enjoyable** e.g. HTML/CSS and Python. In one case, the club

Of the three languages, Scratch was considered the easiest to cover and Python the hardest:

- all of the pro forma respondents reported that Scratch was 'very easy' or 'easy'
- half of the pro forma respondents reported that HTML/CSS was 'very easy' or 'easy' whilst two were 'neutral' and four felt it was 'difficult' (one did not teach it)
- only one respondent reported that Python was 'very easy' whilst seven were

Interview findings echoed those of the pro forma with **consultees reporting that they found Scratch the easiest and Python the hardest to teach**: 'I found Python as much of a struggle as the children…You need a lot of time to get to grips with it…'

Some teachers without an IT role or coding expertise reported that they learnt the languages alongside the children which was an effective form of delivery, as this teacher points out:

> *I didn't teach the children – it was more learning with them. It worked well. They know I am not an expert…They got a buzz when they could do something I couldn't. It developed their confidence and self-esteem.*

4.1.4. Pupils' response to the three languages

In terms of their pupils' response to the three languages, as might be expected, consultees reported that **pupils found Scratch relatively easy and engaging, with HTML/CSS being more challenging but still engaging and Python the most difficult**.

In terms of pro forma responses (out of 14 respondents):

- the majority (11 respondents) reported that pupils found Scratch 'very easy' or 'easy' whilst three were 'neutral'
- two respondents reported that pupils found HTML/CSS 'easy' whilst five were 'neutral' and five reported that pupils found it 'difficult' and two that it was 'very difficult' (one of these did not go on to teach it)
- only one respondent reported that pupils found Python 'easy', whilst two were 'neutral, seven reported that it was 'difficult', one that it was 'very difficult' and three had not taught it.

Interviewees echoed the views of pro forma respondents, with this interviewee summing up consultees' views on pupils' response to the three languages:

> *Pupils loved Scratch and would have done it the whole time if possible…Python was a bit trickier and wasn't as fun and animated. At first they found HTML hard but then they realised how they could manipulate it, it clicked and they could get on with it…Python was harder with typing in the code…if the spelling was wrong it all had an effect so they found it harder.*

Interviewees also provided further context to these responses. Several reported that it was primarily the lower-ability children who found HTML/CSS and Python more difficult:

> *The lower-ability children lost track…They couldn't understand what they were doing [in Python] and the impact it was having…Children just weren't enjoying it any more. It was too difficult for the low achievers.*

Other consultees reported pupils starting to lose interest in Code Club once HTML/CSS and Python were introduced: '...their interest was waning and they had less staying power…'.

4.2. What has worked well or less well?

4.2.1. What has worked well?

In terms of what had worked well in running Code Club this year, respondents gave a range of responses. Two areas were reported by the majority of consultees:

- **the ease of using the Code Club UK website and resources** and, in particular,
  the projects' clarity and step-by-step approach which makes them easy to follow for both club leaders and children and allows children to progress

The projects provide great step-by-step approaches to all three languages.

Great resources: pupils really engaged with the material. They loved adapting and creating their own games. Very good problem-solving activities.

The project resources, links, and solutions. Very easy for all to follow, including the children.

The pupils responded very well to the HTML lessons…

The variety of projects was good. So many things they can do: the quizzes, animations, and paint program kept them interested.

The resources are excellent – the detail of the instructions is great as it allows the children to be more independent and become problem solvers as they try to fix their own mistakes when their creations may not work as they anticipated.

- **Pupils' enthusiasm for, and commitment to, coding and their enjoyment of the projects,** particularly Scratch, and their enthusiasm in using Scratch in other areas of the curriculum and out of school (some linked this to children's voluntary attendance):

Children have really enjoyed creating the games on Scratch and they found HTML editing very challenging but enjoyable.

The children's enthusiasm has been brilliant and they have been proud of what they have achieved. Some have taken these skills and produced some fabulous work at home.

They have a genuine passion and enthusiasm for coding-related activities.

Consultees also mentioned other factors for success:

- having a **regular time slot** to code
- having a **small group of pupils** to focus on
- **flexibility to select projects**
- having an **additional adult in the room or an IT expert on site** at the same time as the club to support with any technical issues and set up the laptops, as this teacher remarked: 'When I came to use Python, I had to download something which I had trouble with and the technician sorted it'
- pupils receiving **certificates** in assembly when they completed a unit which was motivational
- the **existing skills and expertise and enthusiasm of the club leader** who, in one case, was a volunteer from business

- (less commonly reported) the **support of the senior leader**: 'our head teacher
  kept popping into the club to see what the pupils were doing and was

4.2.2. What has worked less well?

When asked about what had worked less well, consultees commonly reported **difficulties in covering Python and, to a lesser extent, HTML**. In relation to Python, club leaders found the units more challenging to deliver and many did not have the expertise themselves or support from others in school to ensure ease of delivery. In addition, some commented that the Python units were too advanced for primary pupils. As two consultees pointed out: 'Even our technicians said that it was too advanced for the age of our children' and '…they are not ready yet. They [pupils] recoiled back from it'. Similarly, a smaller number of consultees reported their lack of expertise in HTML/CSS and commented that it was harder to enthuse pupils with HTML/CSS after Scratch as it was a big jump in difficulty and 'dry' and that if the instructions were simplified this would help: 'Children were keener on the games-based coding and the later projects were less enthusing'. One consultee suggested that the resources could be enhanced by the addition of 'some physical computing projects, maybe using Makey Makey/Crumble/Raspberry Pi'.

Other comments on HTML/CSS reported by individual consultees related to: the HTML element linked to Trinket not working and a reply from Code Club UK not being forthcoming to an email; and the overly-structured approach of HTML/CSS.

However, it is worth noting that half of the club leaders (11 consultees) did not report any difficulties in covering HTML/CSS.

Another key issue mentioned by around a third of club leaders (seven consultees) was **pupil absence and drop-out**. Where pupils missed a few sessions due to illness and other events, they dropped behind which meant they needed additional support to catch up. Some consultees also reported a high drop-out from their club through clashes with other clubs and pupils leaving the school, with a small number noting that girls were more likely to drop out than boys.

Some club leaders also faced **technical issues**. These usually related to pupils forgetting their passwords for their online accounts and time being wasted resetting accounts. In some cases, school filtering made it difficult for pupils to receive password reset information. A minority of consultees reported a slow or lack of response from Code Club UK to technical queries. As the club was only around 40-45 minutes allowing for pupils to settle down and log on and off, any additional technical issues really reduced what could be achieved in sessions.

One club leader made a comment regarding the layout of the units. They reported that children often skipped the explanation and went straight to inputting coding without thinking about what they were doing. This consultee asked if, to counteract this, the instructions could be made more prominent e.g. by larger text and bold so that they are not glossed over.

As mentioned previously, only one school consulted had an outside volunteer running their club. They mentioned the volunteer's lack of experience in behaviour management which they felt undermined their authority with pupils. They suggested that behaviour management would be a helpful addition to volunteer training.

4.2.3. Caveats and considerations in the running of the trial

On the pro forma and during interviews, teachers were asked if they had shared content or approaches that they had used during the trial.

Seven pro forma respondents and four interviewees (i.e. half of the teachers consulted) reported sharing content, resources, or teaching approaches with other teachers in school.

This included

- children sharing their projects as part of class assemblies with teachers being shown how the children had made them
- emails to the IT teacher and class teachers
- Code Club projects and resources being shared with staff as continuing professional development or in staff meetings
- showing the designated computing teacher HTML/CSS projects and examples of what had been covered in Code Club and children giving this teacher a lesson that they had particularly enjoyed.

Eleven respondents reported that Code Club content, resources and teaching approaches had been used in normal lessons. In the main, staff had used Scratch resources and projects but one also mentioned Python resources being used. In some cases, they were used in normal lessons whilst one consultee mentioned Scratch resources being used in 'golden time' sessions with pupils who were more advanced. Two respondents mentioned Scratch resources such as the Ghost

Busting module being used with Year 5. In some cases, this involved the Year 5 control children accessing some of the Code Club resources in lessons but, in other cases, they were used with other classes.

Almost all of the respondents (16) reported pupils attending Code Club sharing their knowledge of coding with their peers. This included Code Club children:

- supporting teachers by acting as 'experts' or 'digital leaders' in lessons and helping pupils who were struggling with coding
- supporting the teacher to deliver Scratch to their peers
- giving examples in class of some of the work they had done on Scratch
- putting examples of their work on the school website for other pupils to view
- demonstrating Scratch in school open days
- sharing their projects in an assembly
- talking informally to friends.

In two cases, pupils in the control group had attended Code Club but this seemed to be only one pupil. In another case, control children attended the first session only due to some confusion.

This data suggests that some control group children may have been exposed to resources and approaches used in Code Clubs (i.e. some contamination may have occurred in the trial). However, this is unlikely to have impacted on the primary outcome scores since a significant impact was detected via the Coding Quiz.

4.3. What are the key success factors?

Code Club leaders were asked about the key success factors for running their club. This question was answered by 13 teachers completing the pro forma and the eight interviewees i.e. 21 in total. Their responses are shown in Table 4 below.

The factor that was considered the most important for the successful running of Code Clubs was the projects provided by Code Club UK, with four-fifths of the consultees reporting that they were 'very important'. As these interviewees pointed out:

> *...any staff member could deliver using them…It is really simple and I had not used them myself before I set up Code Club*
>
> *They are critical to get the club off the ground so I'd give them a 5 [i.e. they are 'very important']*
>
> *Having the projects ready-made was vital as I was completing the projects myself before the sessions so I was better placed to help the pupils.*

Where consultees felt that the resources were less important, this was because, for technical reasons, the school had been unable to access them so they were unable to comment, or the club leader was very competent in coding and therefore used a wide range of resources in sessions. As one interviewee pointed out: 'The need for them lessens over time as the lead becomes more confident and knowledgeable'. The **teacher notes were also considered to be 'very important'** by just less than three-quarters of consultees but, as with the projects, need for these depended on the existing and developing knowledge and expertise of the club leader.

As might be expected, **the engagement of pupils was also reported to be 'very important' or 'important'** by all but two consultees.

Considered of a little less importance was the presence of a volunteer with prior coding knowledge or experience (from within/outside school) due to the simple step-by-step nature of the projects that a novice could follow. It was, however, considered **of key importance to have an enthusiastic volunteer to lead the club which was, by most, perceived to be more important than the support of the senior leadership team**. In many cases, the senior leadership team had not been involved in the setting up or delivery of the club. As these three interviewees pointed out:

> *It's more about the drive of the teacher/volunteer running the club*
>
> *I have been learning with the children. So the support of the senior leadership team is less important – it's more important to have a keen Code Club lead. It can be helpful though to get it off the ground*
>
> *You need one person who drives it. You don't necessarily need SLT or for them to back it.*

There were also mixed views on the need for an after-school setting. Some consultees felt that this was not always the best scenario as there was competition with other clubs and some had lost pupils to other clubs. Consultees reported that the club could be run at lunch-time but a dedicated hour would be needed. Club leaders did, however, value the voluntary nature of the club which attracted pupils actively wanting to learn coding.

Table 4: Factors for successful running of Code Clubs

Factor	Rating of 5 to 1 with 5 being 'Very important' and 1 being 'Not at all important'				
	5	4	3	2	1
Projects provided by Code Club UK	17	2		1	1 (not accessed)
Teacher notes provided by Code Club UK	15	4		2	
Engagement of pupils	15	4	2		
Presence of a volunteer with coding knowledge (teacher/from outside)	9	7	2		3
Support of senior leadership team	5	5	4	2	5
After-school setting	4	9	6	2	

When asked about other factors for success, consultees mentioned:

- timely support from Code Club UK with technical issues and queries and email notifications from Code Club UK about issues identified/rectified
- coding programmes correctly working
- projects at the appropriate level for pupils
- parental commitment and support
- appropriate accommodation and resources in school i.e. a computer suite and laptops, hardware, and a comfortable space where pupils can work on their own and in groups.

4.4. Perceptions of outcomes for pupils

Consultees were very positive about the impact of Code Clubs on pupils, identifying a range of impacts including:

- development of skills in coding and IT more generally
- increased confidence in coding and using computers
- increased enjoyment of coding and enthusiasm to continue learning
- development of problem-solving skills and increased resilience, tenacity, and patience in problem solving
- increased independence as well as confidence and skills in collaborative working
- improved skills in reading and processing information.

As might be expected, and this is reflected in the findings from the Coding Quiz reported earlier, the vast majority of club leaders reported pupils' **development of skills in coding** (and understanding of how the input affects the outcome) as well as the **development of ICT skills** more generally. Consultees also noted that they and other staff had noticed these skills transferring to regular lessons in both coding and maths:

They [Code Club pupils] demonstrated superior knowledge to their peers when a secondary school ICT teacher visited to run a basic HTML session.

[Pupils have been] upskilled by being in Code Club - they have developed skills at a much faster rate than they would normally during lesson time.

Staff have fed back that they are using the skills in class.

They made great strides forward and there was an impact on the regular curriculum.

You can see the impacts transferring to the regular curriculum. They are not scared to have a go now.

They have been able to transfer their skills. From the anecdotal evidence from class teachers, there has been an impact on maths.

In addition, club leaders reported a range of ‘softer’ outcomes that pupils gained from attending Code Clubs as detailed below.

- The vast majority of consultees reported **pupils’ increased confidence in coding and using computers in general**. Two felt that this was particularly the case for girls and a large proportion reported that this had translated into confidence in lessons and in demonstrating coding to their peers:

Pupils are far more confident in ‘having a go’ at new coding platforms.

They have become more confident in coding and in using the computers in general.

They have improved their programming skills which has given them more confidence in lessons.

A couple of the girls were a little reticent and lacked confidence at the beginning of the year but it was lovely to see their self-confidence grow as the year went on.

[Code Club pupils are] far more confident in using new technology.

- Also noted by many club leaders was **pupils’ enjoyment of coding** – resulting from the ‘fun’ nature of Code Clubs, being able to progress at their own pace and their sense of achievement – as well as **their enthusiasm for further coding** beyond Code Club, including at home: ‘They have a genuine passion and enthusiasm for coding related activities’

- Another key impact was **pupils’ development of problem-solving skills and their greater resilience, tenacity, and patience** in problem solving. This was linked to an understanding of the need to review and evaluate their work and that, if the programme did not work, not to see it as a failure but to check their code and make any necessary changes (‘de-bug’):

They also developed problem solving and understanding that if you fail it's not a fault. You have to work it out and move on…

If the program does not work, children are able to go over and check their code more carefully.

They were scared of getting things wrong at first but now they know it's OK to be wrong and try…

It was also good for determination and resilience – debugging and fixing errors – which have applications in other subjects.

You see an amazing difference in the kids. They understand the concept of checking code and finding bugs.

- Club leaders also reported contrasting skills in both **independence and collaborative working**. In particular, pupils were benefiting from drawing on each others' knowledge and skills, working with children they did not previously know and making new friends:

They have all helped each other…They have been comfortable saying they can't do things and asking friends/the group for help.

It was a collegiate approach and I saw a difference in the pupils early on.

[At first] it is alien and scary and they don't know each other and they are not with their friends. Now they have made new friends and are chatty and confident. They are sharing what they have made and are proud of it.

- Finally, a small number of club leaders reported that pupils had developed their **skills in reading and processing information** – this was felt to be a really positive development, particularly for children who struggled with literacy.

It is worth noting that teachers' perceptions in some of these areas do not always reflect those of the pupils who responded to the Pupil Attitude Survey. For example, Code Club pupils responding to this survey did not feel that they had become better at problem solving and working with others as a result of attending Code Club. In addition, a lower proportion was interested in learning about and making things with code than at baseline. As mentioned before, this may be due to pupils' moving onto more difficult coding and finding it more difficult and understanding some of the issues in working together with their peers. However, additional research is needed to explore the contradictions in these findings further.

A final spin-off outcome of Code Clubs is that, in most schools, **pupils are acting as role models** for other pupils in general lessons. This is positive for the Code Club pupils but is also inspiring other pupils to undertake coding. As one teacher commented: 'Younger children want to come after hearing how excited and inspired the Code Club kids are'.

4.5. Views on outcomes for different types of pupils

4.5.1. Are outcomes different for boys and girls?

The majority of club leaders did not feel that engagement and impacts were different for boys and girls: 'Boys and girls love it equally. They feel really good when they have debugged something'. However, just less than half reported differing impacts for boys and girls but presented opposing views.

Five consultees reported that impacts were greater for boys than girls. They explained that fewer girls attended the club in the first place and that they tended to be less enthused. In particular, they reported that it was generally the high attaining girls that were enthusiastic whilst boys of all abilities were perceived to be motivated throughout: 'Boys were more committed and achieved more than girls'. It was also reported that girls could be less resilient and were more afraid than boys to make mistakes: 'Girls [are] less resilient and don't have the patience to keep going. They feel overwhelmed if the code does not work the first or second time'. However, having said this, one club leader added that 'the opportunity to engage girls more is a good thing'.

In contrast, **four consultees considered that impacts were greater for girls than boys**. One reported that, although there were both girls and boys in the club who persevered from the start, in general, girls tended to be less confident initially but they became very competent at coding. Boys started off more confident but tended to need more support as the activities become more challenging:

A couple of the girls lacked confidence at the beginning of the sessions but their confidence and self-belief increased greatly as the weeks went by – they 'dug deep' and solved many of their own errors. In contrast, a couple of the boys were over-confident but when the going got tough with the HTML projects they gave up easily and constantly asked for help, wanting their issues solved straight away rather than just be pointed in the right direction.

The other three consultees agreed that, although girls could start off more hesitant, they equalled or overtook boys over time:

The most able coders were definitely the girls

The girls were quieter in class but very strong and went through step-by-step and did well

Boys seem to enjoy the process more, girls enjoy the end product. Boys are keener at first but this soon becomes equal.

4.5.2. Are outcomes different for pupils with different levels of attainment?

Again, **the majority of consultees did not report differences in impacts between pupils with different levels of attainment**, and some went so far as to say that some pupils with lower attainment had excelled at Code Club as the following comments illustrate:

One of the children who is a 'digital leader' has gone streets ahead. The pupil also has special needs and is excelling in coding but not in other subjects (such as English). Coding is more of a leveller

I had one or two kids with low ability needs and they did very well…one was in the SEN reading group but you would not know in Code Club. They did quite well and it was very interesting – they had a chance to excel…Some kids were able to shine when they struggled elsewhere

> *Some pupils can be really good at it when they are not so good at other things like writing and maths*
>
> *It is very methodical and it does offer opportunities for the less proficient to excel and the more able to have to think more.*

However, a minority of consultees reported that some less-able children experienced difficulties in reading and understanding instructions which slowed their progress: ‘Some of the less-able children found it hard following the complex instructions as it was taking them a long time to read them’. However, one of these consultees reported that lower achievers benefitted from the small steps they made and were proud of their progress.

A small number of consultees reported the benefits of pupils practising coding at home and involving their parents which speeded up their progress in the club. These tended to be the more high-attaining pupils:

> *When pupils have access at home and have done more at home, you can tell when they are coming back. It is hugely important. They have involved parents…They would be much further behind if they weren’t practising at home.*

4.6. Views on time for pupil outcomes to be realised

Consultees were asked how long they felt it took for impacts to be realised for pupils.

Over half of all consultees (13 consultees) felt that **impacts were seen by the end of the first term of Scratch** (with two feeling that they were realised within half a term). During this time, most pupils had grasped the concepts and developed their confidence in coding and had become more confident in using IT more generally. However, ten consultees qualified this by saying progress varied by child and that for more complex understanding – for example gained through HTML/CSS and Python - a longer time was needed i.e. up to a year.

A further six consultees thought that **one to two terms were needed** in order to allow time for HTML/CSS to be covered and **for pupils to build resilience and be confident**

in working independently: 'Normally after two terms they're able to work independently and they have the skills to tackle a problem first, before coming to me for help'.

The remaining three consultees felt that two terms to a full academic year were needed for impacts to be realised.

4.7. Perceptions of outcomes for teachers

Although the evaluation did not set out to gather data on teacher impacts, when able to add additional comments, consultees reported a range of positive impacts on themselves. These tended to be reported by the club leaders who had set up their club as part of the trial who had no prior experience of running the club or of coding, but this was not always the case. These impacts on club leaders included:

- the development of confidence in coding which would now be disseminated to other staff
- greater familiarity, expertise, and skills in all of the programming languages, with a particular mention of HTML/CSS and Python by more experienced

4.8. Additional comments

In the free comments section at the end of the pro forma and as concluding comments in interviews, many consultees noted that they would be running their club next year. Fifteen clubs had been set up in September 2015 – most as part of the trial - and many of the consultees in these schools reported that they would not have run otherwise. They reported that they had benefitted from participation in the trial and were glad that they had taken part. As one interviewee commented: 'Something that has started as a result of the trial will continue. I now have more confidence that I can do it...'

However, consultees also reported changes that they would make when running their club next year. One reported that the school would open the club up to more pupils and would involve teaching assistants. Another said that the club would run for a term at a time covering Scratch and would then start again with a new group of pupils, while another reported that they would cover the languages in a different order with Python coming before HTML/CSS. Some consultees were unsure if they would cover Python again as pupils found it too difficult and they asked if Code Club UK could make the resources easier. Others were making plans benefitting from the knowledge of what had worked well or otherwise, as well as the time that projects took to deliver.

As the following feedback indicates, other consultees provided very positive comments about the Code Club UK resources and the running of the trial:

> *It's a fantastic resource and it enables pupils to succeed when they haven't elsewhere. It's a very good skill for pupils to develop and it opens up lots of opportunities for them in the future. It's a great thing to be exposing children to and in the future they will be glad that they did it. All the world is based on IT now and they need to do it and it's very positive for their future*

> *It has been a very good project and I hope it will continue and the resources are very good and will be useful in future dissemination and I hope they will continue to be available*

> *Great communication from the NFER team with clear instructions. Super projects from Code Club. Thank you to everyone.*

5. Conclusions

The conclusions of the National Evaluation of Code Clubs are detailed below.

5.1. Outcomes

The aim of the evaluation was, through an RCT and associated process evaluation, to assess the impact of attending Code Club for an academic year on Year 5 primary pupils':

More specifically:

- computational thinking – the primary outcome measured via the Bebras assessment
- coding abilities – measured by a Coding Quiz
- attitudes towards using computers and coding more generally – assessed via a Pupil Attitude Survey.

The findings from the analysis of pupils' scores at baseline and endpoint on the primary outcome measure, Bebras, indicate that **attending Code Club for a year does not have an impact on pupils' computational thinking over and above changes that would have occurred anyway**. This lack of impact could be due to these skills already being developed through the normal computing curriculum in school and Code Club consolidating rather than further improving pupils' skills in these areas, or a year not being long enough for more significant changes to be seen. We have also considered whether the assessment is sensitive enough to measure differences between the groups – see discussion below.

Before the trial, when making decisions about a suitable primary outcome measure, consideration was given to the Bebras assessment in terms of the range of scores, the validity of the assessment, and if it could be easily administered. The range of scores seemed appropriate, the test measures computational thinking which is closely related to the skills one would learn when developing experience in coding, and the assessment is successfully carried out annually to a large online sample. Taking these factors into account, it was decided that the Bebras was a suitable assessment to use as the primary outcome. Whilst the Bebras is traditionally used as a one-off challenge rather than to measure change over time or intervention effects, in this trial we see that both the Code Club and control group pupils improved over time. This improvement was a 16-point change from first test to second test, showing the test is certainly sensitive to change and so we can be fairly confident that it is sensitive enough to pick up differences between the groups if there were any.

It is unlikely that the lack of difference between the groups is due to the evidence of contamination described above in Section 4.2.3 since an impact was seen in one of the secondary outcomes (the Coding Quiz – see next bullet). Furthermore, although there was substantial attrition within the trial, this was mainly at the school-level and therefore is unlikely to have led to substantial bias. Attrition will, however, have reduced the statistical power of the analysis.

However, baseline and endpoint data from the Coding Quiz shows that, as might be expected, **attending Code Club does significantly improve pupils' coding skills in Scratch, HTML/CSS, and Python**. This occurs even when control children are learning Scratch as part of the computing curriculum in school and some contamination may have occurred. In addition, **pupils attending Code Clubs report increased usage of all of the coding languages** – with the largest increase being seen in the usage of Scratch, followed by HTML/CSS and then Python. This reflects teachers' reports on pupils' relative enjoyment of the three languages and the difficulties they have faced in using Python (and HTML/CSS to a lesser extent). Control pupils have shown an increase in their usage of Scratch – perhaps driven by their coverage of this as part of the computing curriculum in school – but not of the other two languages.

Findings from the Pupil Attitude Survey suggest that, **attending Code Club for an academic year, results in pupils' increased usage of computers, as well as positively impacts on how good they feel they are at making things with code**. It also has a slight positive impact on their perceptions of how good they are at trying new challenges.

However, the data from the evaluation, suggests that, **attending Code Club for a year does not impact on the following**:

- **pupils' perceptions of their abilities in following instructions and patterns, problem solving, finding errors and correcting them, checking and improving work and learning about new things**. One possible explanation of these findings is that Code Club pupils were undertaking these activities more frequently and at a higher level and were, as a result, better able to assess their skills and were more aware of the difficulties and challenges that can be encountered. However, it is worth noting that the Bebras assessment did not detect any improvements in pupils' computational thinking which corroborates findings relating to skills in this area

- **pupils' perceptions of their abilities in working with others** including working with new people, working on a team and sharing their work with others. In terms of working in a team, the proportion of pupils reporting that they are very good/good at these activities has decreased from the baseline. Again, one possible explanation of these findings is that Code Club pupils were undertaking these activities more frequently and were, as a result, better able to assess their skills and were more aware of the difficulties and challenges that can be encountered. However, further data to explain these findings would need to be collected to explore this further

- **pupils' future interest in coding and learning about coding languages**, with Code Club pupils being less interested in these areas at endpoint than at baseline. However, as mentioned above, this may be related to pupils' difficulties and lack of enjoyment in covering Python and, to a lesser extent, HTML/CSS, as reported by teachers

- **pupils' interest in doing a job that involves coding**. However, understanding more about coding, what it involves and its complexities can both motivate and deter pupils from considering a career in coding.

In the interviews and pro forma, **teachers have reported a range of positive impacts for pupils, many of which echo pupils' own reports – such as the development of confidence and skills in coding, IT and using computers**. However, teachers have also reported impacts on pupils' enthusiasm to continue learning code and their skills in collaborative working. As mentioned before, this contrasts with pupils' reports who may have rated their abilities lower in these areas, perhaps as a result of working at a higher level and being aware of pitfalls. Teachers also reported pupils' increased skills in problem solving which was not borne about by pupils' reports and the Bebras assessment.

Teachers have reported mixed views in terms of differences in outcomes by gender and attainment and so no conclusions can be drawn in this regard.

Regarding how long it takes for outcomes to be realised, there are also mixed views from teachers. However, it seems that **early impacts on understanding concepts and developing confidence in coding can be seen at the end of the first term** as a result of pupils working with Scratch. However, **two to three terms are needed to see progress in terms of pupils working independently and having the resilience to work out problems for themselves**.

Although not a key focus of the evaluation, outcomes for teachers and schools have been reported as a result of the trial. **Teachers have reported the development of their confidence and skills in coding. Schools have also benefitted from being able to utilise the skills of Code Club pupils in lessons to support those struggling with**

coding. In addition, for many schools consulted, none of the outcomes above would have been realised without the trial as that was the sole impetus for their club being set up.

5.2. Content and delivery

Data gathered through the teacher consultations is overwhelmingly positive and **teachers have been very complimentary about the Code Club UK website, projects and teacher notes**. They have also reported their pupils' enthusiasm and commitment and the benefits in having a small group of pupils and flexibility to select projects.

Some teachers have faced difficulties in delivering Code Club due to insufficient time, technical issues and lack of knowledge of the languages, though most have reported that their club has run very smoothly this year.

Pupils have most enjoyed learning Scratch, with teachers generally reporting that they found Python harder to teach and pupils finding it more challenging and less engaging. HTML/CSS falls somewhere in the middle.

Factors for success in running Code Club include:

- access to the Code Club UK projects and teacher notes
- the engagement of pupils
- dedicated time to run the club
- the presence of a volunteer from within or outside school to deliver the club.

It is **not seen as crucial, however, that the club leader has existing coding knowledge as the Code Club UK projects are perceived to be self-explanatory** and club leaders have reported that they have learnt coding alongside pupils.

5.3. Concluding statement

Code Clubs can play an important role in improving pupils' coding skills in Scratch, HTML/CSS, and Python and their usage of these programming languages. They can also have a knock-on positive effect on pupils' confidence in using, and usage of, computers, as well as their perceptions of how good they are at making things with code. Teachers report that Code Club UK's projects are of high quality, clear, simple, and easy to deliver which makes setting up a Code Club – even for those staff with no prior experience of coding – relatively straightforward.

Appendix A: Regression models

For the primary outcome measure, the Bebras Computational Thinking Assessment, a regression model was run with total score on the Bebras at post intervention as the dependant variable, and group (control/intervention) and total score on Bebras at baseline as predictor variables. A dummy variable for each school was added to the analysis in order to account for the fact that the randomisation was stratified by school. The overall model was significant $F (22, 316) = 4.426$ $p <.001$ and the model explained 19 per cent of the variance (adjusted $R2 = .193$). Whilst the group variable did not predict score on post-test $\beta = .027$, $t = 0.51$, $p > .05$, the baseline Bebras score did predict Bebras score at post intervention $\beta = .203$, $t = 3.78$, $p < .001$.

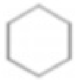
For the secondary outcome measure, the Coding Quiz, a regression model was run with total score on the Coding Quiz at post intervention as the dependant variable with group (control/intervention) and total score on Coding Quiz at baseline as predictor variables. A dummy variable for each school was added to the analysis in order to account for the fact that the randomisation was stratified by school. The overall model was significant $F (18, 251) = 5.32$, $p < .001$ and explained 24 per cent of the variance (adjusted $R2 = .236$). The group variable did predict post intervention score on the Coding Quiz $\beta = .304$, $t = 5.17$, $p < .001$. The baseline score also predicted post intervention score on the Coding Quiz $\beta = .121$, $t = 2.09$, $p < .05$.

Appendix B: Bebras Primary Outcome Measure

B.1 Baseline assessment

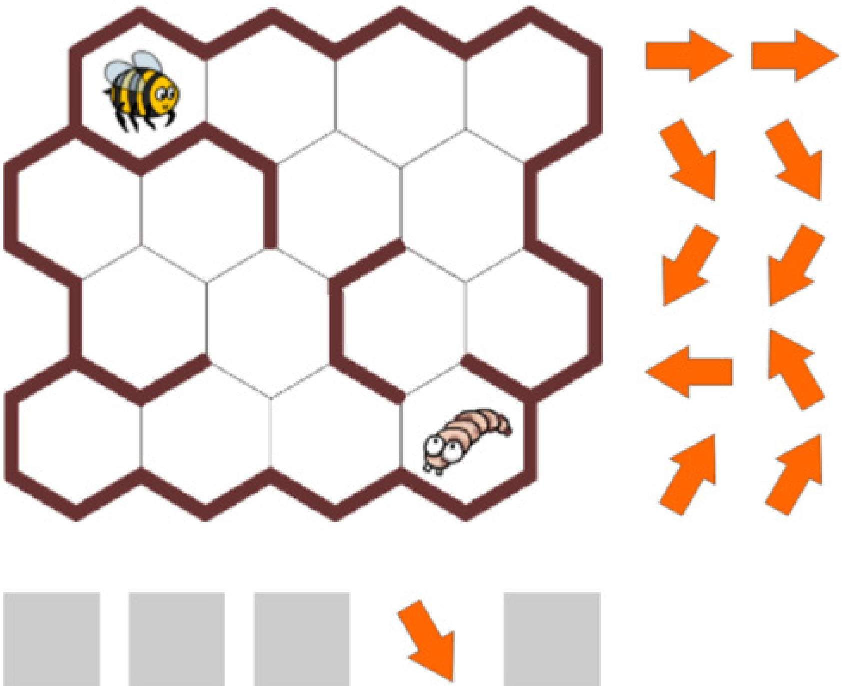
Beehive

A bee  must feed the larva  .

In the beehive the bee can move from once cell  in the hive to the next.

Some cells have walls  around them that block the way for the bee.

Using arrows, show the bee how to get to the larva!



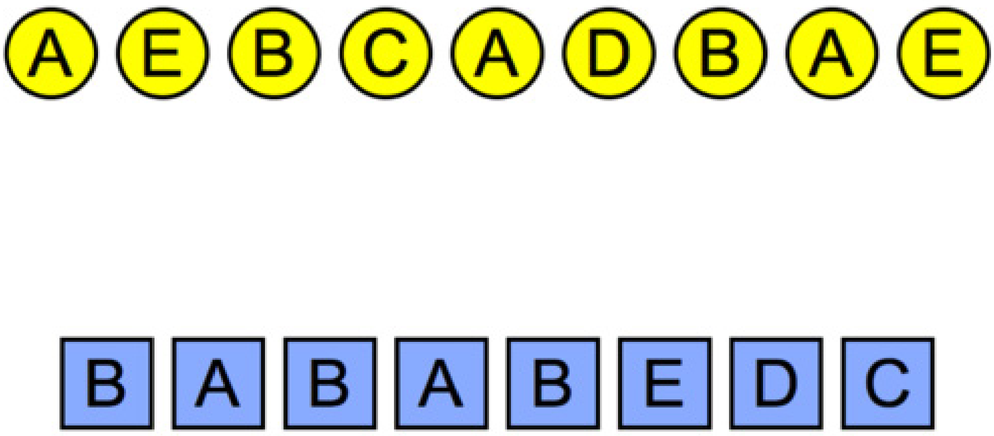
Put the correct arrows in the grey squares.
The bee has to reach the larva in five moves.
The fourth move has already been filled in for you.
When you are ready, click on "Save!"

Connecting letters

Draw lines with your mouse between circles and squares to connect the same letters.
You do this by clicking on a circle and dragging with your mouse.

There are three rules you must obey:

Only one line from each circle is allowed.
Only one line to each square is allowed.
The lines may not cross each other.



Draw as many connections as possible and click 'Save'.

(Hint: The number of connections you can make is either 3, 4, 5 or 6.)

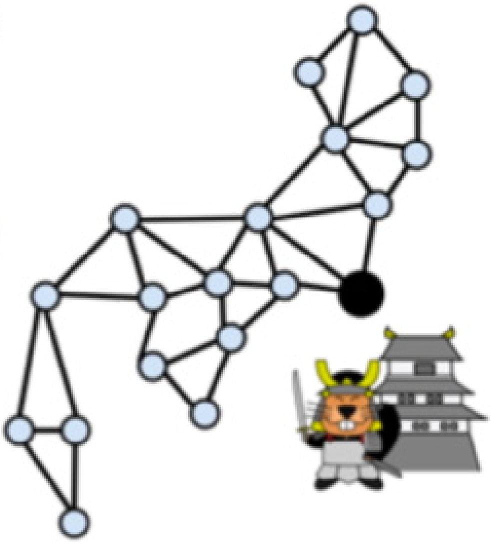
Beacon

A long time ago, the beaver warrior of Japan built a network of beacon stations. When an emergency occurred, the beacons were lit to warn the whole country.

The stations are shown as circles in the picture. If two stations are
connected by a line, this means that they are 'neighbouring' stations.

When a beacon is lit, it will take a minute before the neighbouring beacons will see the signal fire. They then light the fire in their own beacons.

After another minute, the neighbours of these neighbours will see the signal fire and light their beacons. This sequence is repeated until all stations have lit their beacons.



One day the beacon of the headquarters is lit (the large black circle on the map).

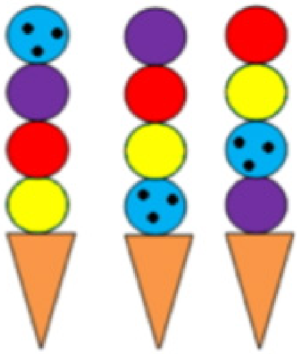
How many minutes does it take until all the beacons are lit?

Ice cream cones

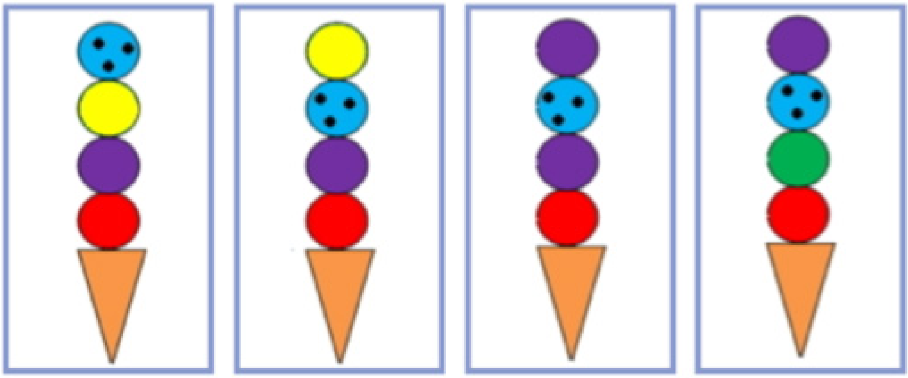
A special ice cream machine fills ice cream cones with four scoops.

It does this in a very mechanical way.

The picture shows, from left to right, the last three ice cream cones created by the machine.

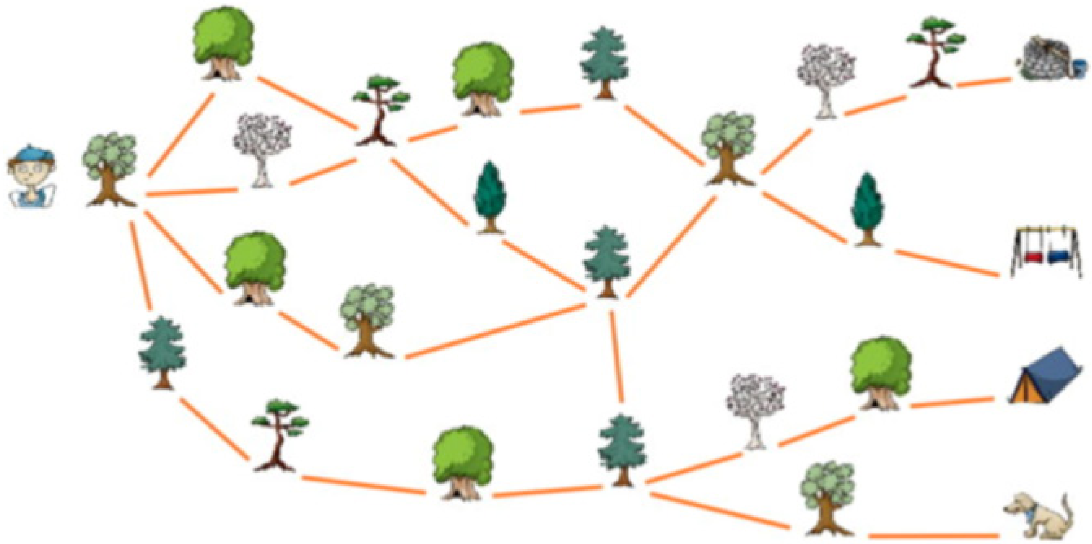


What will be the next ice cream cone produced by the machine?



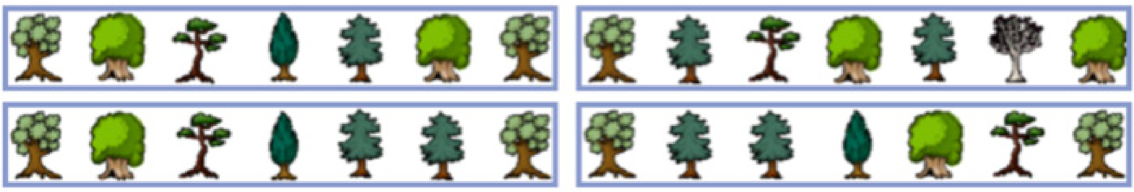
In the forest

Rupert went for a walk in the forest.
There were several possible paths but the one Rupert chose led him to a dog.



Below are four possible paths Rupert may have taken. Which is the one that led him to the dog?

(The trees are shown in the order in which he saw them.)



Jeremy in the bushes

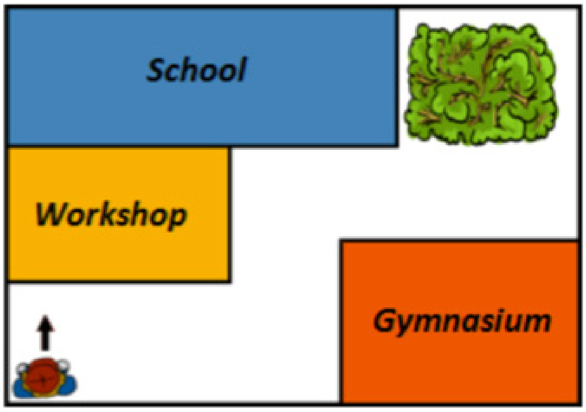
Some children are playing a robot game - Jeremy is the robot and he listens only to these orders: forward, left, right.

If he hears "forward", he walks straight ahead until he hits an obstacle (building, fence, bush).

If the children say "left", Jeremy turns left but doesn't move.

If the children say "right", he turns right but doesn't move.

Jeremy starts in the left lower corner of the playground and he looks at the workshop. The children want to navigate him into the bushes in the upper right corner of he playground.



Which orders will the children shout to navigate Jeremy into the bushes?

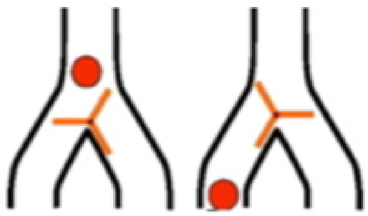
- right forward left forward left forward
- forward right forward left forward right forward left forward
- right forward left forward right forward right forward
- forward right forward left forward left forward left forward

Flipflop

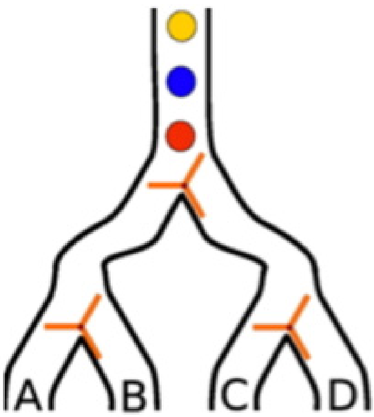
A flipflop is something that is always in one of two possible states.
Every time a ball comes through a flipflop the state changes.
The beavers use flipflops that work as follows:

The ball falls from the top and then goes either left or right depending on the state of the flipflop.

While falling, it pushes the flipflop so that the next ball falls in the other direction.



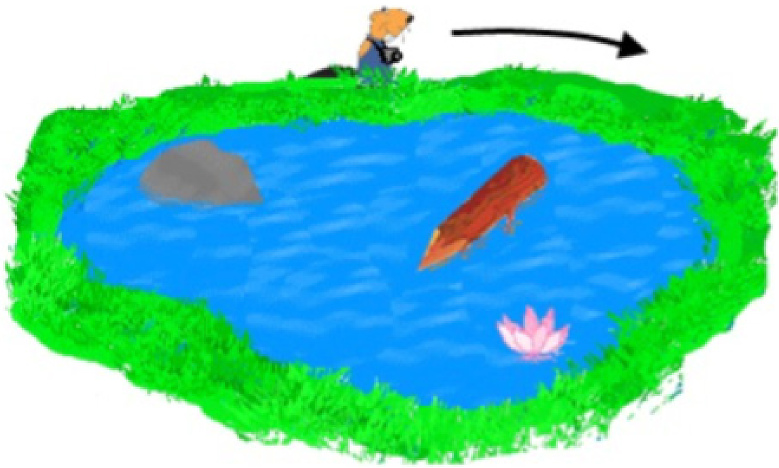
The beaver builds a machine out of flipflops that looks like this:



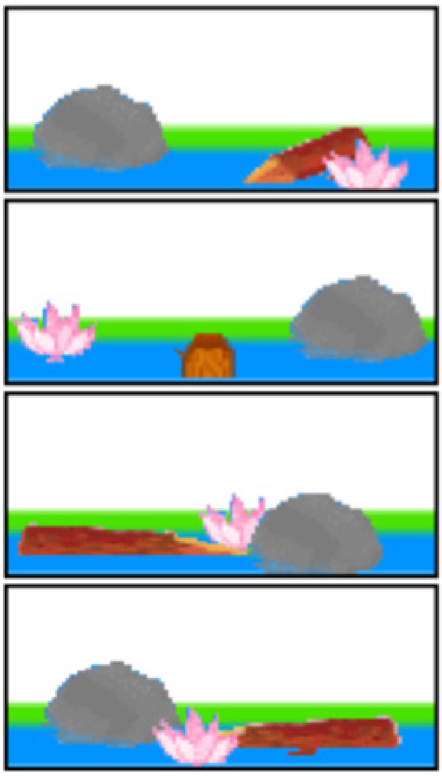
Out of which pipe will the third (yellow) ball fall?

Photo tour

A beaver goes for a short walk around a little pond. She starts in the position shown in the picture and walks around in the direction of the arrow.



During her trip she takes 4 pictures:



Drag the pictures in the order that she sees them!

Swapping

During the big flood of last spring Benny Beaver lost everything except for the feather on top of his hat.

He wishes to trade his feather for something else, that he will then again trade for something else, etc.

His goal is to obtain a nice beaver home after several trades.

Benny has found the following possible trades on the beaver net.

For example, Anna would like to trade his feather for a balloon.

How can Benny get a home by making trades?

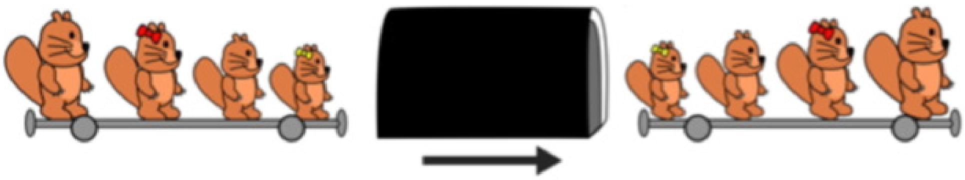
Drag the trade offers to the right side, and place them in the correct order.
When you are done, click on 'Save'.

Beaver	Takes	Gives
Anna	Feather	Balloon
Bert	Feather	Basket
Claudia	Balloon	Boat
Daniel	Boat	Motor Cycle
Emile	Balloon	Bicycle
Francisca	Basket	Boat
Gustav	Basket	Dog
Helen	Dog	Balloon
Ivo	Bicycle	Balloon
Jeanine	Dog	Rug
Klaus	Rug	Motor Cycle
Lili	Painting	Rug
Monika	Bicycle	Motor Cycle
Norbert	Rug	House

Beaver	Takes	Gives
Drag from the left to here and then place in the correct order!		

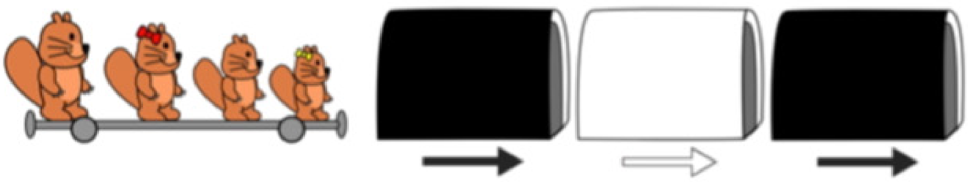
Zebra tunnel

The beaver railway has two special types of tunnels. If a train travels through a black tunnel, the passengers come out in **reverse** order:

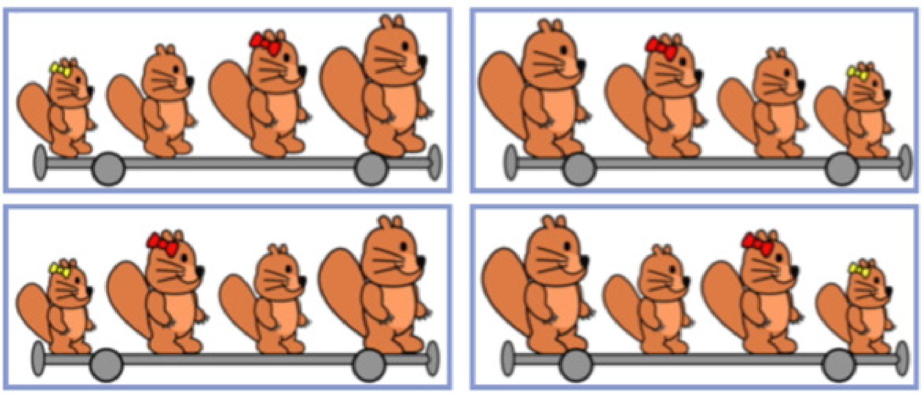


If a train travels through a white tunnel, the **first** and **last** passenger automatically change position:

The following train goes through three tunnels:



In which order do the beavers come out of the last tunnel?



Soda machine

Oh no! The new drink machine at school has only two buttons.

But you can choose four drinks from the machine:
The hot drinks coffee and tea, and also the cold drinks apple juice and soda water.

The clever janitor has programmed the machine so that you can choose your drink by pressing twice:
First you press A to choose a hot drink, or B to choose a cold drink.
Then you press A for coffee or B for tea, or A for apple juice or B for soda water.

As there was no manual provided some students have tried to make their own.

Unfortunately not all of the instructions are correct.

The following is an example of a correct instruction:
First you press B, and then A, for apple juice.

Which instruction is correct?

First you press A, and then you press B for tea.

First you press A, and then you press A again for two hot drinks.

First you press B, and then you press B again for ice tea.

Press B for soda water.

Building bridges

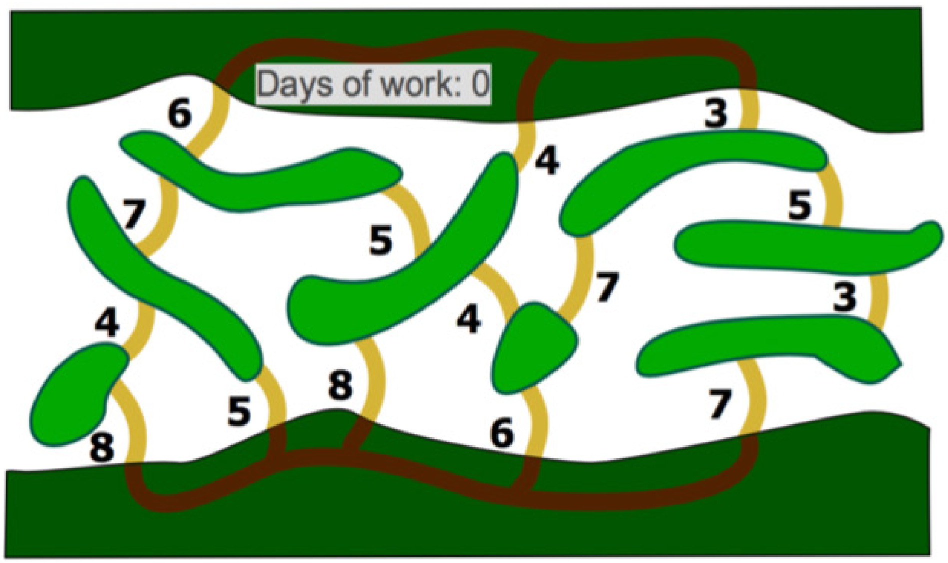
There are many islands in the river. Bob the Beaver wants to build bridges in order to make it possible to walk from every island to every other island, and from river bank to river bank. So far no bridges have been built.

Bob the Beaver wants to spend as little time as possible building.

Bob has made a plan that shows all the places where it is possible to build a bridge.

Bob has placed a number next to each possible bridge that shows how many days of work it would take to build that bridge.

Show Bob how to build his bridges in as few days as possible.



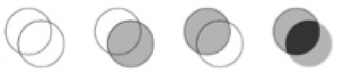
Click in the map on the place where Bob should build a bridge.
You can click on a bridge again to have it removed.
The map will show how many days it will take Bob to build those bridges.
When you are ready click on "Save"!

B.2 Endpoint assessment

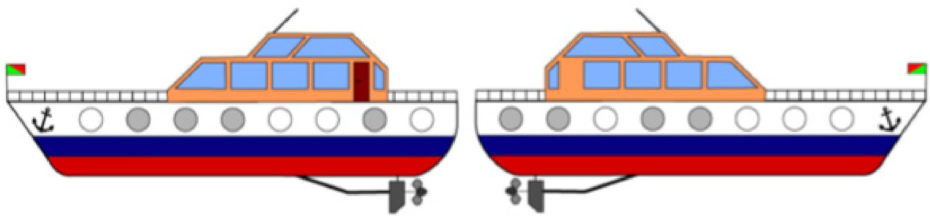
Funny windows

The windows of a boat are either clear or lightly tinted.

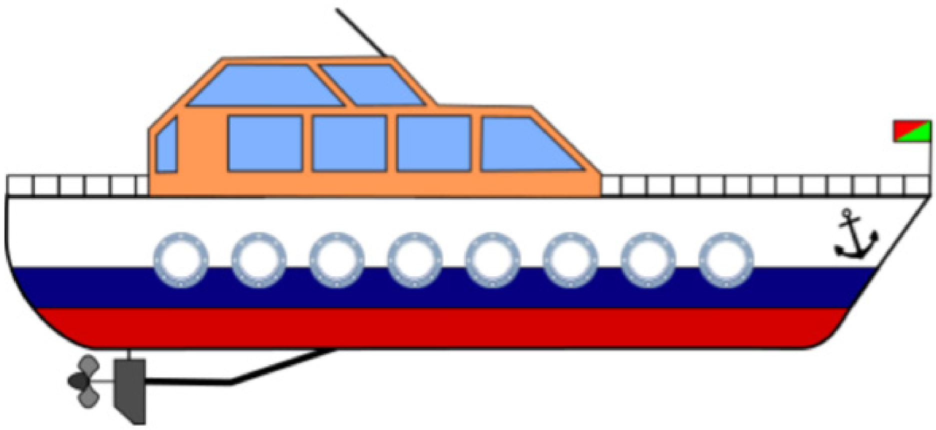
Standing beside the boat you can look through two opposite windows at once.
Depending on the colours of both windows they will appear to have a new colour:



Captain Krysta has given you drawings of both sides of her boat. They show which windows are clear and which are lightly tinted:



Click on the windows of the boat below to show what you would see if you stood beside it and looked through opposite windows.



Ice cream

At the LIFO icecream parlor the scoops of icecream are stacked on your cone in the exact order in which you ask for them.

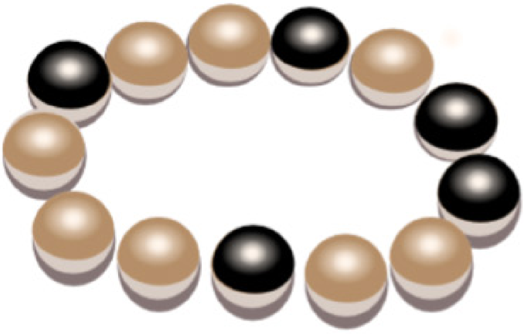
What do you have to say in order to get the icecream shown in the picture?

I would like to get an icecream with ...

- ... Chocolate, Smurf and Strawberry!
- ... Strawberry, Smurf and Chocolate!
- ... Chocolate, Strawberry and Smurf!
- ... Strawberry, Chocolate and Smurf!

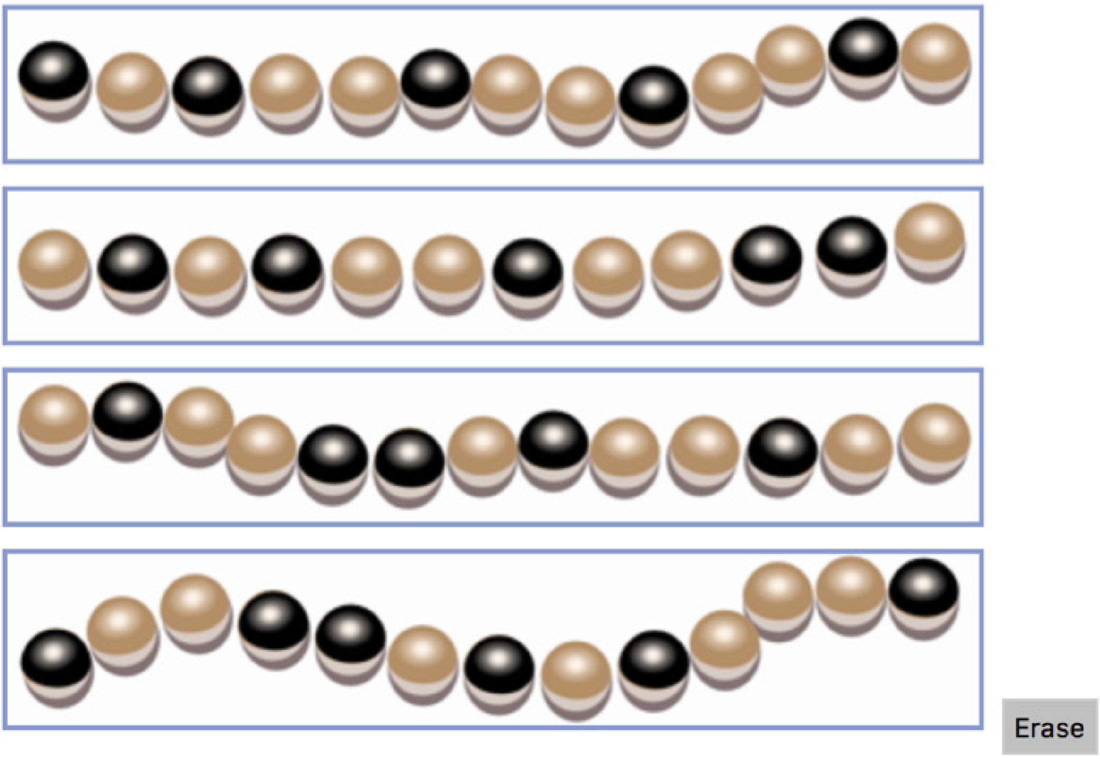
Magical bracelet

A princess has a magical bracelet that looks like this:



When she stores her bracelets in her drawer she first opens them.

Which of the four bracelets in her drawer is the magical one ?



Only nine keys

Daniel is sending text messages from his old phone.

For every letter he has to press the proper key once, twice, three or four times, followed by a short pause.

In order to type 'C' he has to press the number 2 key three times because 'C' is the third letter written on this key.

In order to type 'HIM' he has to press the number 4 key twice, followed by the number 4 key 3 times and finally the number 6 key once.

Daniel presses exacly six times to enter the name of a friend.

What is the name of his friend?

Miriam

Iris

Emma

Ina

Noughts and crosses

You are playing a game of noughts and crosses with your friend. First your friend has to place an 'O', then you place your 'X'. You continue taking turns in this way. The first player who produces a line of three wins. (The three noughts or crosses can form a line by being horizontal, vertical or diagonal.)

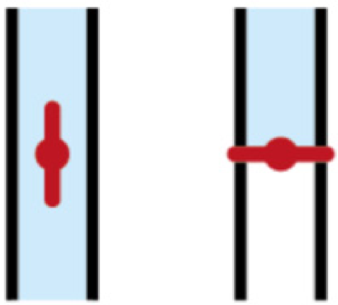
It is your turn to put an 'X' in the grid below:

X	1	2
O	O	X
O	3	4

Click on the grid to place your 'X' so that you have the best chance of winning.

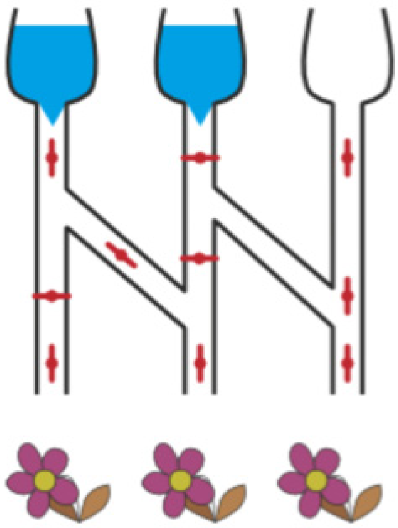
Watering

The diagram shows how a watering system is connected. The system consists of tubes and valves.
Open and closed valves are shown in the diagram by the direction of the switch:



Open valve Closed valve

Water only flows through open valves.



Which of the flowers (if any) will receive water when the valves are in the positions shown in the diagram.

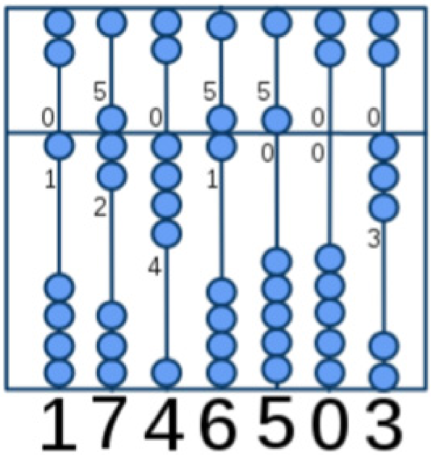
Click on the flowers that will receive water so that they look bright and fresh.
Leave the flowers that will not get any water looking wilted.

Abacus

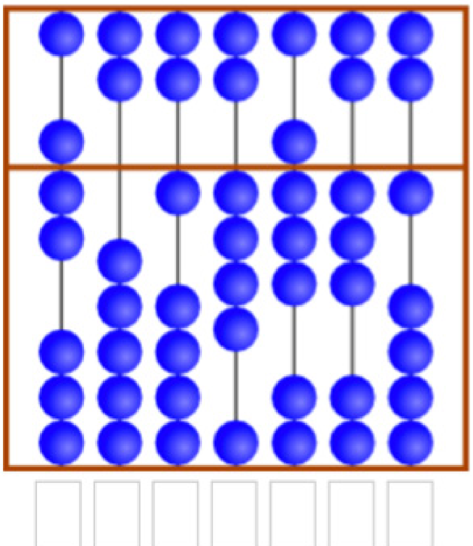
A number is shown on a Chinese abacus by the position of its beads.

The value of a bead on the top part is 5; the value of a bead on the bottom part is 1. The abacus is reset to zero by pushing the beads away from the center.

This is how you would use the abacus to show the number 1,746,503:



What number does the following abacus show? Enter the digits below the abacus.



Select a picture

Johnny has 8 photos. He wants to give one to Bella.

He asks Bella three questions to help him select the best picture.

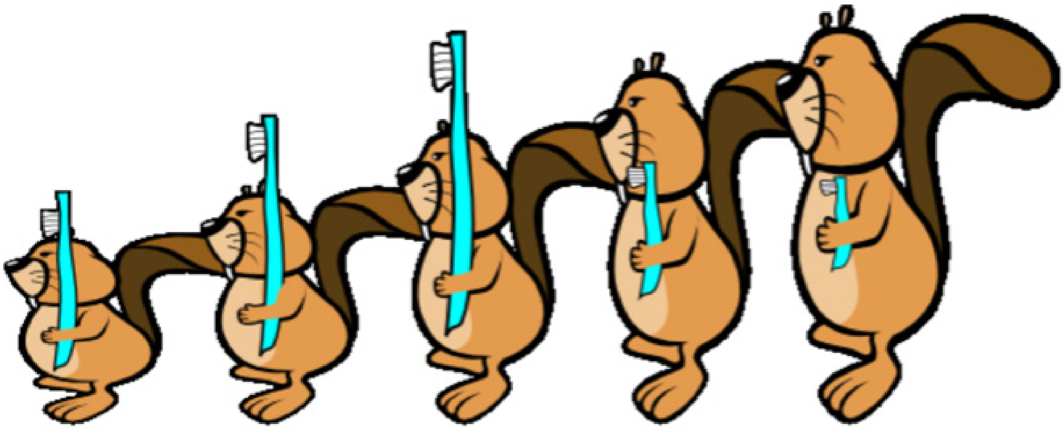
Johnny's Question	Bella's Answer
Do you want a photo with a beach umbrella?	Yes
Do you want a photo where I wear something on my head?	No
Do you want a photo where you can see the sea?	Yes

Which photo should Johnny give to Bella?

Erase

Toothbrushes

It is time for bed! Every beaver should have a tooth brush that matches their size.. But look at the picture to see what has happened.



Ann Ben Chad Dan Eve

"Not so fast!" sighs mother beaver. "Eve and Chad, swap your brushes! Ann and Chad, you too!" But then she does not know how to continue.

Which two beavers still need to swap their toothbrushes so that all the beavers have the correct brushes?

Ben and Chad

Ann and Eve

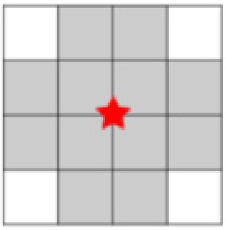
Ben and Dan

Nobody

Village network

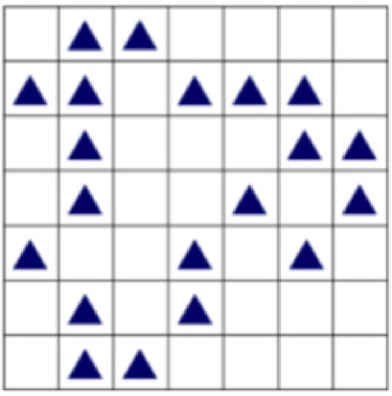
A village is receiving a new wireless network consisting of several network towers. The network will offer WiFi to all the villagers.

Every network tower has the coverage area shown below. The red star shows the network tower. Only in the twelve shaded squares surrounding the tower will a house get a WiFi signal.



The picture shows a map of the village divided into squares. Every triangle ▲ is a house.

A network tower cannot be built inside a square, only on the cross point of the village squares. The coverage areas may overlap.



What is the minimum number of network towers required to provide coverage to every house? Enter a number from 1 to 10.

Clinging robots

The clinging robot walks along the road, always clinging to one side of the road. The clinging robot knows four commands:

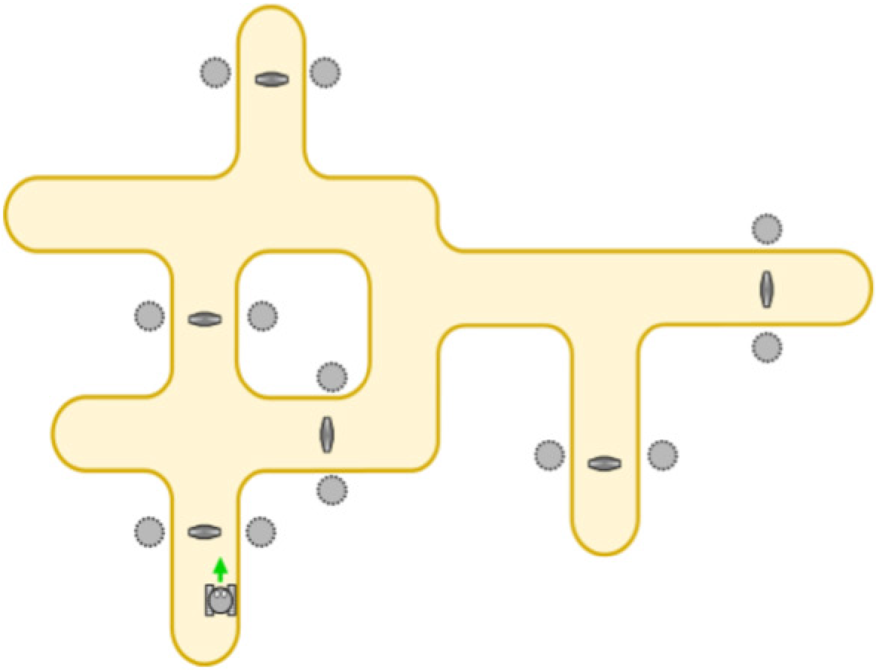
Command	Explanation
START	Start walking along the side where you are standing
CONTINUE	Keep walking along the side where you are walking
SWITCH	Switch to the other side of the road and keep walking
STOP	Stop walking

A command is executed whenever the robot walks across one of the grey magnetic strips on the road. All these strips are shown on the map.

The clinging robot is given the following instruction set:

- **START SWITCH CONTINUE CONTINUE CONTINUE STOP**

The robot starts where shown in the picture. Click on the grey spiky circle where the robot stops.

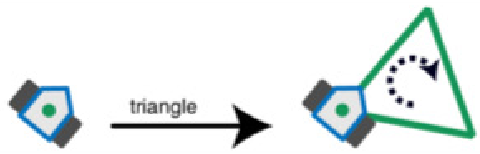
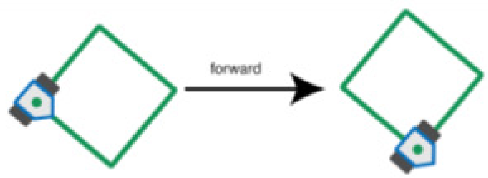
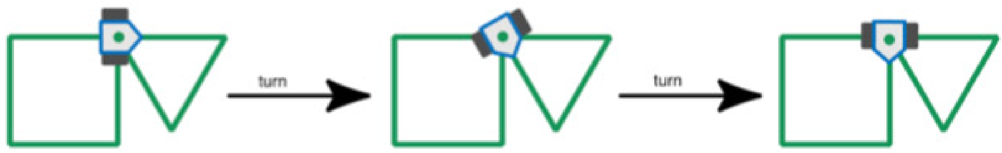


Drawbot

The robot 'Drawbot' can drive and draw at the same time!

You can give the drawbot the following instructions: **square**, **triangle**, **forward**, **turn**.

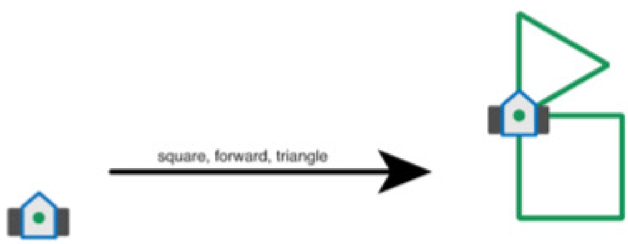
The instructions work as follows:

square: Drawbot draws a square. At every corner he turns right.	
triangle: Drawbot draws a triangle. At every corner he turns right.	
forward: Drawbot drives forward on a line that has been drawn until the next corner.	
turn: Drawbot turns to the right until the next drawn line.	

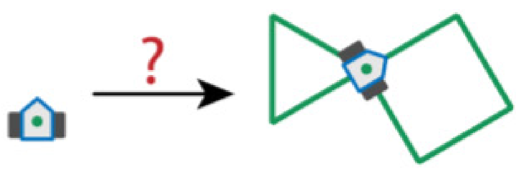
You can also give a sequence of commands to drawbot:

For instance: **square, forward, triangle**

The image on the right shows what will happen:



Which sequence of instructions causes this to happen?



- square, turn, forward, triangle
- triangle, turn, square
- triangle, turn, forward, square
- square, forward, square, turn, triangle

Appendix C: Coding Quiz

Thanks for taking part in this coding quiz! You're helping us to find out what young people learn at Code Club.

This quiz contains multiple-choice questions about 3 different programming languages. If you don't know the answer to a question, don't worry! You can make an educated guess, or just click "I don't know".

Privacy
Your answers will remain confidential and will only be seen by you, your teachers and the research team. They will not be shared with your classmates or your parents/carers unless you choose to do so yourself. You will not be identified in any report that is produced from the research.

1. Please enter your ID:

2. Please enter your name:

First name

Last name

3. Please select your gender:

- Male
- Female

4. Please enter your date of birth (day/month/year):

DD MM YYYY

Date: / /

5. Please select your school:

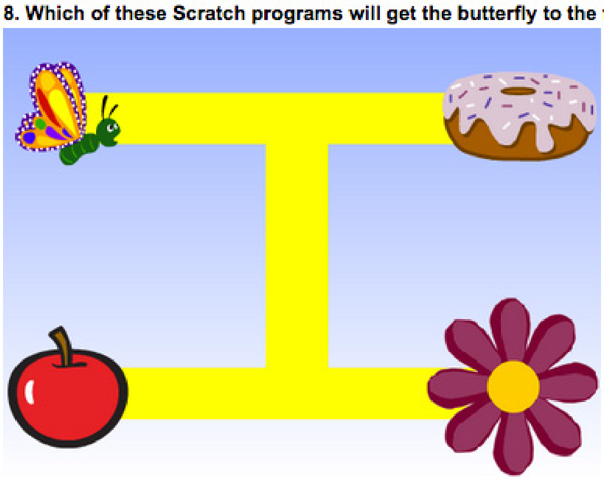
6. Which sentence describes how often you make things using Scratch?
Think about at home, school and in clubs.

- ○ I have never used it
- ○ I use it sometimes
- ○ I use it every week
- ○ I use it every day

7. What have you made using Scratch? (tick as many as you like)

- ☐ I haven't made anything
- ☐ Nothing useful, just trying out Scratch
- ☐ Animations or stories
- ☐ Music
- ☐ Art
- ☐ Games
- ☐ Other (please specify)

8. Which of these Scratch programs will get the butterfly to the flower?



○
```
move 200 steps
move 200 steps
```

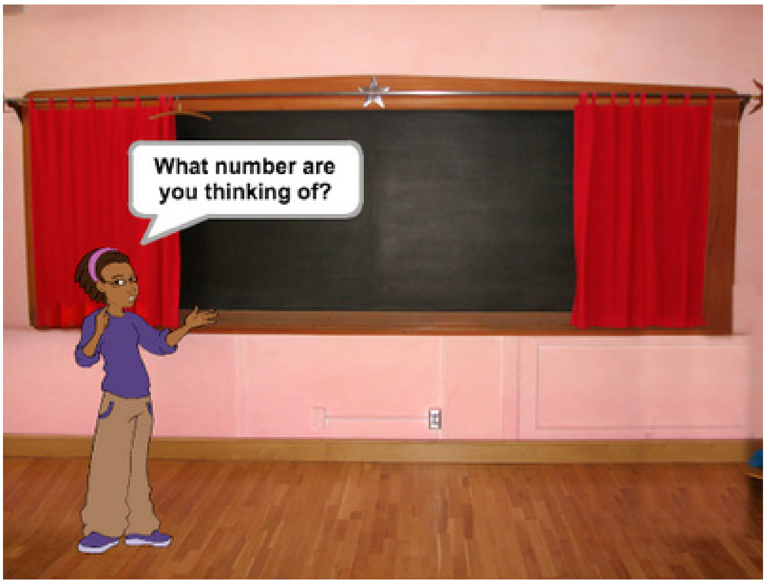
○
```
move 200 steps
move 200 steps
turn ↻ 180 degrees
move 200 steps
move 200 steps
```

○
```
move 200 steps
turn ↻ 90 degrees
move 200 steps
turn ↻ 90 degrees
move 200 steps
```

○
```
move 200 steps
turn ↻ 180 degrees
move 200 steps
turn ↺ 180 degrees
move 200 steps
```

○
```
move 200 steps
turn ↻ 90 degrees
move 200 steps
turn ↺ 90 degrees
move 200 steps
```

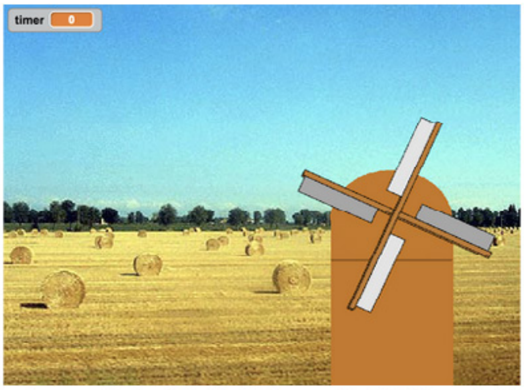
○ I don't know

9. 

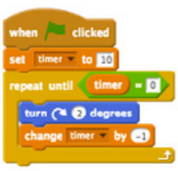
Look at the script below:

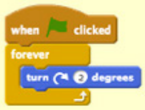
Which number could you enter to make the teacher say "Great!"?

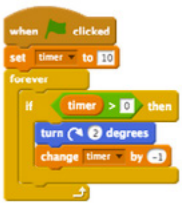
- ◯ -5
- ◯ 20
- ◯ 19
- ◯ 21
- ◯ 0
- ◯ I don't know

10. 

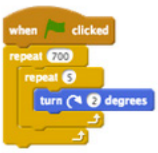
When the green flag is clicked the blades on this windmill turn clockwise. Which of these sequences would make the windmill rotate the longest?

◯ 

◯ 

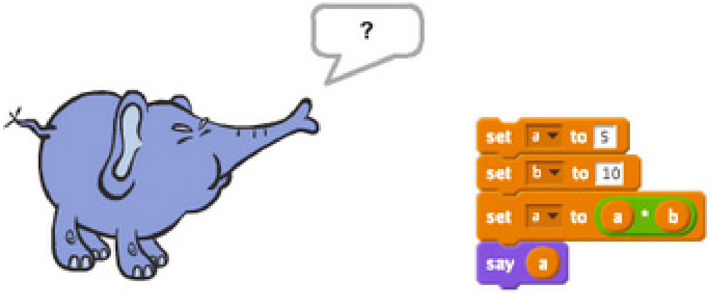
◯ 

◯ 

◯ 

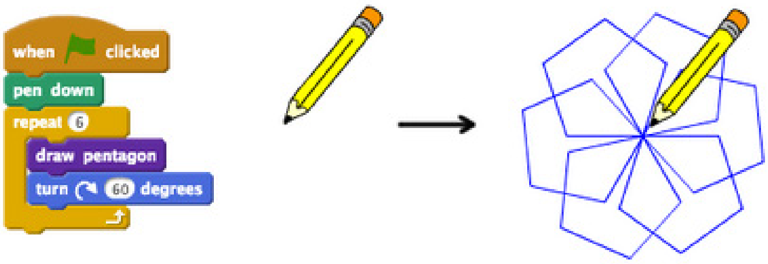
◯ I don't know

11. What will the elephant say?



- ○ a
- ○ 50
- ○ 5
- ○ 15
- ○ a*b
- ○ I don't know

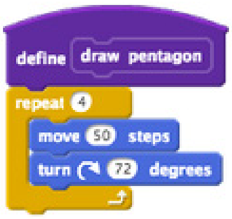
12. Here's some Scratch code to draw a snowflake made up of 6 5-sided pentagons.



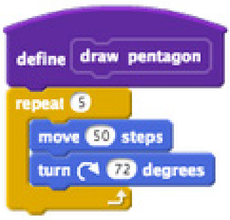
Which is the correct code for the custom block to draw a pentagon?

○

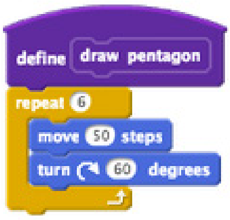
○



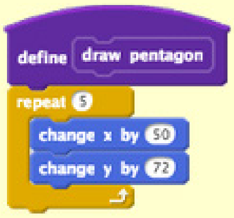
○



○

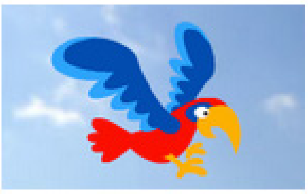


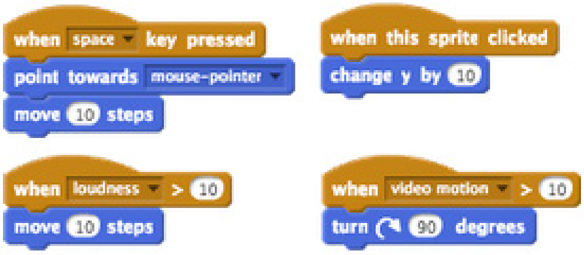
○



○ I don't know

13. Here is some Scratch code that is used to control a parrot sprite:





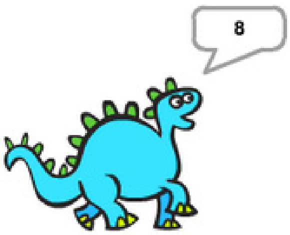
Which of the following would you need to do to move the parrot to the right?

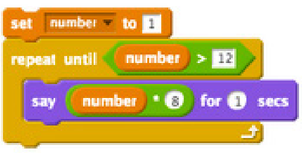
- ◯ Do nothing
- ◯ Move in front of a camera
- ◯ Press the space key
- ◯ Make some noise
- ◯ Click the parrot
- ◯ I don't know

14. Which of the following can standard Scratch not interact with?

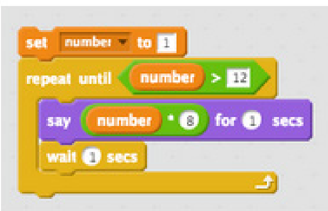
- ◯ Mouse
- ◯ Microphone
- ◯ GPS
- ◯ Sensors
- ◯ Webcam
- ◯ I don't know

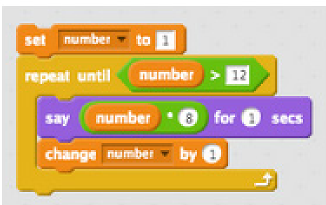
15. In the program below, the dinosaur should say the 8 times table, however there's a problem with the code and the dinosaur repeatedly says "8".

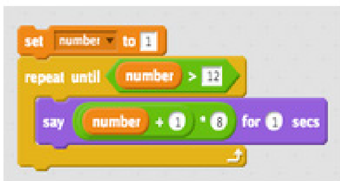


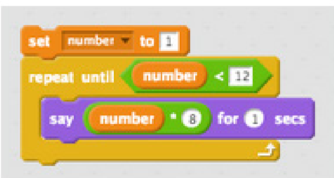


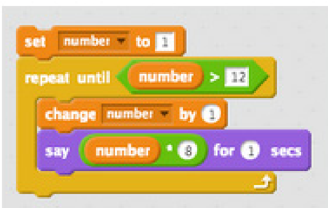
Which script contains the correct code to make the dinosaur say the complete 8 times table?

◯ 

◯ 

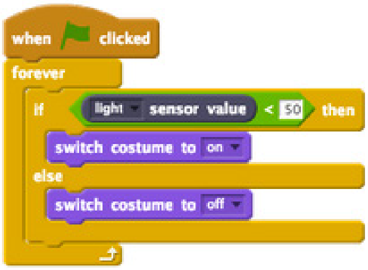
◯ 

◯ 

◯ 

◯ I don't know

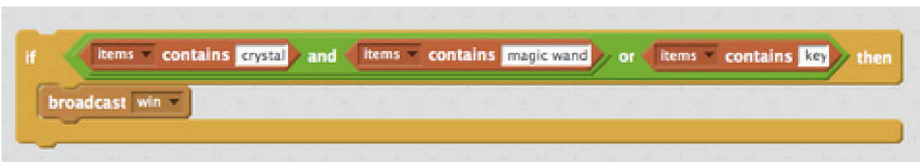
16. Here's some Scratch code:



What would it be sensible for this code to control?

- ◯ 
- ◯ 
- ◯ 
- ◯ 
- ◯ 
- ◯ I don't know

17. Here is some Scratch code for deciding whether a player has won a game.



Which of these item lists would not allow the player to win?

- ◯ crystal, flaming sword, ring of power, potion of invulnerability
- ◯ crystal, magic wand, flaming sword
- ◯ crystal, magic wand, key
- ◯ crystal, magic wand, key, flaming sword
- ◯ key, ring of power
- ◯ I don't know

HTML stands for HyperText Markup Language, and is the language used to make websites.

CSS stands for Cascading Style Sheets, and is the language used to make websites look nice.

18. Which sentence describes how often you make things using HTML & CSS?
Think about at home, school and in clubs.

- ◯ I use it every day
- ◯ I use it sometimes
- ◯ I use it every week
- ◯ I have never used it

19. What have you made using HTML & CSS? (tick as many as you like)

- ☐ I haven't made anything
- ☐ Text-based web pages
- ☐ Web pages with images
- ☐ Web pages with hyperlinks
- ☐ Web pages including sound, video or other content
- ☐ Web pages including colour, fonts and other style
- ☐ Other (please specify)

20. Which is the correct HTML code for inserting a link to the Code Club website?

- ◯ Code Club
- ◯ <a href="http://codeclub.org.uk">Code Club<a>
- ◯ Code Club
- ◯ <a href="http://codeclub.org.uk">Code Club
- ◯ Code Club
- ◯ I don't know

21. What is the bug in the following embed code for a really cool YouTube video?

```
<iframe width="560" height="315"
src="https://www.youtube.com/embed/FxhGIajRsq4"
frameborder="0" allowfullscreen>
```

- ◯ It should include a name="..." attribute.
- ◯ The height and the width numbers don't match
- ◯ It uses https not http
- ◯ There's no </iframe> tag at the end
- ◯ It shouldn't say allowfullscreen
- ◯ I don't know

22. Which of these HTML tags insert an image into a webpage?

- ○
```
<img src="robot.png">
```
- ○
```
<img src="robot.png">A robot</img>
```
- ○
```
<image src="robot.png" />
```
- ○
```
<image src="robot.png">
```
- ○
```
<picture src="robot.png">A robot</picture>
```
- ○ I don't know

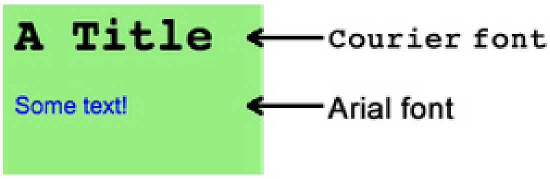
23. Each of the options below produces a webpage that looks a bit like this...

> **Code Club**
>
> Code Club is a nationwide network of free volunteer-led after-school coding clubs for children aged 9-11.

...but which of these body markups best matches the structure of the page?

- ○
```
<p>
<h1>Code Club</h1>
Code Club is a nationwide network of free volunteer-led after-school
coding clubs for children aged 9-11.</p>
```
- ○
```
<p><font size="5"><b>Code Club</b></font>
<br />
<p>Code Club is a nationwide network of free volunteer-led
after-school coding clubs for children aged 9-11.</p>
```
- ○
```
<h1>Code Club</h1>
<p>Code Club is a nationwide network of free volunteer-led
after-school coding clubs for children aged 9-11.</p>
```
- ○
```
<p style="font-size: 16pt; font-weight: bold;">Code Club</p>
<p>Code Club is a nationwide network of free volunteer-led
after-school coding clubs for children aged 9-11.</p>
```
- ○
```
<p><big><big><strong>Code Club</strong></big></big></p>
<p>Code Club is a nationwide network of free volunteer-led
after-school coding clubs for children aged 9-11.</p>
```
- ○ I don't know

24. Which CSS code would be needed to create a webpage that looks like this:



- ◯
```
<style>
   body {
      background: blue;
   }
   h1 {
      font-family: Courier;
   }
   p {
      color: lightgreen;
      font-family: Arial;
   }
</style>
```

- ◯
```
<style>
   body {
      background: lightgreen;
   }
   h1 {
      color: black;
   }
   p {
      color: blue;
      font-family: Arial;
   }
</style>
```

- ◯
```
<style>
   body {
      background: lightgreen;
   }
   h1 {
      font-family: Arial;
   }
   p {
      color: blue;
      font-family: Courier;
   }
```

- ◯
```
<style>
   body {
      background: lightgreen;
   }
   h1 {
      font-family: Courier;
   }
   p {
      color: blue;
      font-family: Arial;
   }
</style>
```

- ◯
```
<style>
   body {
      background: lightgreen;
   }
   h1 {
      font-family: Courier;
      text-decoration: underline;
   }
   p {
      color: blue;
      font-family: Arial;
   }
</style>
```

- ◯ I don't know

Python is a text-based programming language that can be used to make loads of awesome programs and games.

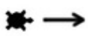
25. Which sentence describes how often you make things using Python?
Think about at home, school and in clubs.

- ○ I have never used it
- ○ I use it sometimes
- ○ I use it every week
- ○ I use it every day

26. What have you made using Python? (tick as many as you like)

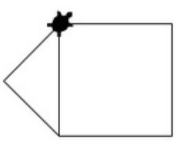
- ☐ I haven't made anything
- ☐ Nothing useful, just trying out Python
- ☐ Text-based games and programs
- ☐ Picture-based programs (e.g. turtle graphics)
- ☐ Graphics-based games (including Minecraft mods)
- ☐ Other (please specify)

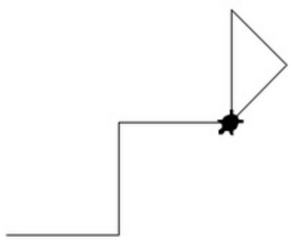
27. A turtle is facing right.

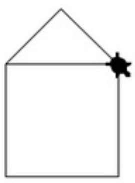


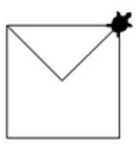
What shape will the following sequence of Python instructions draw?

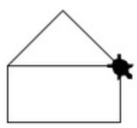
```
forward(100)
right(90)
forward(100)
right(90)
forward(100)
right(90)
forward(100)
right(45)
forward(70)
right(90)
forward(70)
```

○ 

○ 

○ 

○ 

○ 

○ I don't know

28. Look at the following Python code:

```
if mark > 70:
   print("Great!")
elif mark > 50:
   print("Good!")
else:
   print("Try again!")
```

Which numbers will cause the program to print "Good!" to the screen? (Pick all the ones that would work)

- ○ 40
- ○ 65
- ○ 100
- ○ 50
- ○ 0
- ○ I don't know

29. Here is some Python code to make Python print the words of a familiar song.

```
bottles = 10
while [redacted]:
    print(bottles, "green bottles hanging on a wall,")
    print(bottles, "green bottles hanging on a wall,")
    print("and if 1 green bottle should accidentally fall,")
    bottles = bottles - 1
    print("there'd be", bottles, "green bottles hanging on a wall,")
```

Which line of code should be added in place of the black line?

- ○ `bottles > 0`
- ○ `bottles == 0`
- ○ `bottles != 10`
- ○ `bottles < 10`
- ○ `True`
- ○ I don't know

30. Here's a short Python program:

```
a = 10
b = 20
a = b
```

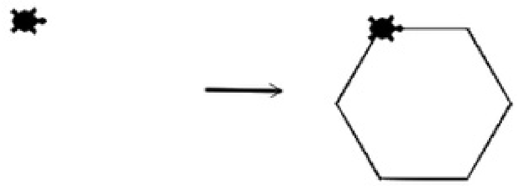
What is the value of variables a and b at the end of this program?

- ○ a=10, b=20
- ○ a=20, b=20
- ○ a=20, b=10
- ○ a=10, b=10
- ○ a='b', b=20
- ○ I don't know

31. Look at this Python function for drawing a shape:

```
def drawShape(sides, length):
   for side in range(sides):
      forward(length)
      right(360 / sides)
```

Which of these lines of code would draw a hexagon (a six-sided shape), with sides of length 75 pixels?



- ◯ `drawShape(6x75)`
- ◯ `drawHexagon()`
- ◯ `drawShape(75,6)`
- ◯
```
drawShape():
  sides = 6
  length = 75
```
- ◯ `drawShape(6,75)`
- ◯ I don't know

32. Here is a Python program to tell the user whether a number is bigger or smaller than 20:

```
number = input()
number = int(number)
if number > 20:
   print("Bigger than 20")
else:
   print("Smaller than 20")
```

When the user enters 20, the program prints "Smaller than 20" when it should print "20!".

Which is the correct version of this code?

◯
```
number = input()
number = int(number)
print("20!")
else:
   print("Smaller than 20")
```

◯
```
number = input()
number - int(input)
if number not 20:
   print("Bigger than 20")
else:
   print("20!")
```

◯
```
number = input()
number = int(number)
if number > 20:
   print("Bigger than 20")
else:
   print("20!")
```

◯
```
number = input()
number = int(number)
if number > 20:
   print("Bigger than 20")
elif number < 20:
   print("Smaller than 20")
else:
   print("20!")
```

◯
```
number = input()
number = int(number)
if number > 19:
   print("Bigger than 20")
else:
   print("Smaller than 20")
```

◯ I don't know

33. What does this Python code print to the screen?

```
lessons = [ "maths" , "english" , "science" , "history" ]
print( lessons[2] )
```

- ◯ science
- ◯ english
- ◯ lessons[2]
- ◯ 2
- ◯ t
- ◯ I don't know

Appendix D: Pupil Attitude Survey

Code Club Pupil Survey: Year 5

INTRODUCTION: You have shown an interest in joining your school's Code Club and we would like to find out what you think about computing, and coding in particular. Our questions will only take around ten minutes to answer. No-one in your school will find out what you have said. We will also be asking you to complete the same survey next year to see if anything has changed.

If there are any questions you don't understand, please ask your teacher for an explanation.

Thank you very much for your help.

A. About you

1. Your school: drop down menu

2. Your initials:

3. Your date of birth:

4. Are you: A girl (picture) 1
   A boy (picture) 2

B. What you think about computing and coding

Please tell us how you feel about computing and coding:

5. Do you understand what coding is? Yes/No/Don't know

6. How often do you use computers and do coding?

		Never	Rarely	Sometimes	Often	All the time	Don't know
a	Use Computers						
b	Make things with code						
c	Use code to make things at home						

If you have responded some/often/all the time to question 6c above, please tell us what coding and activities you do at home and tick all that apply:

(i) Scratch Yes/No
(ii) HTML & CSS Yes/No
(iii) Python Yes/No
(iv) Blockly Yes/No
(v) BBC Coding Yes/No
(vi) Thimble Yes/No
(vii) Code Kingdoms Yes/No
(viii) Codecademy Yes/No
(ix) Espresso Coding Yes/No

7. Have you been involved with any of the following coding acitivites? Pick include all that apply:

a. Coder Dojo Yes/No
b. Code Playground Yes/No
c. Young Rewired State Yes/No
d. Maker Party Yes/No
e. Hour of Code Yes/No

C. About your skills

8. Please rate your skills in the following areas:

Please tick one option in each row

		Never	Rarely	Sometimes	Often	All the time	Don't know
a	Working with new people						
b	Working in a team						
c	Following instructions and patterns						
d	Learning about new things						
e	Trying new challenges						
f	Solving problems						

		Never	Rarely	Sometimes	Often	All the time	Don’t know
g	Designing the things I make						
h	Making things with code						
i	Finding errors and correcting them						
j	Checking what I have done and improving it						
k	Planning what I am going to do						
l	Sharing my work with others						

D. About your interest in computing and coding in the future

9. Please tell us about your interest to do computing and coding in the future:

Please tick one option in each row

		Never	Rarely	Sometimes	Often	All the time	Don't know
a	Learning about coding/ learning more about coding						
b	Making things with code						
c	Learning about coding languages/ learning more about coding						
d	Taking part in coding activities after school						
e	Learning to code at home						

		Never	Rarely	Sometimes	Often	All the time	Don’t know
f	Taking part in coding activities at weekends						
g	Taking part in coding activities in school holidays						
h	Learning to code in school time						
i	Doing a job that involves coding when I grow up						

Thank you very much for answering our questions

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